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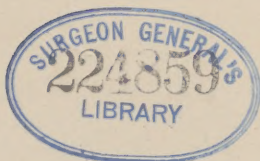
DENTAL ANATOMY

BY

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PREFACE

A realization of the fact that the study of dental anatomy is one of the most important subjects in the college curriculum, and, as a rule, one that is usually neglected by the student even if not by the teacher, has prompted the author to present the subject in the most practical phase possible. Besides giving a description of the teeth as minutely as possible, the author has gone to considerable length in describing the anatomy of the pulp canal, and also the anatomy of the tooth with reference to practical consideration, or, in other words, the practical application of the anatomical points in dental operations. The anatomical shape of the crown and the occlusal surface of the tooth are certainly of extreme importance in the construction of restorations, gold fillings, and inlays, and in order that they may be more easily and accurately reproduced the author has carefully outlined the occlusal surface of the tooth as regards the ridges and grooves. Much space has been devoted to the inclined planes in the description of each tooth, which is bound to prove of much benefit to the student of dentistry in later years in the study of other subjects, especially crown and bridge work, prosthetic dentistry and orthodontia. Realizing the importance of root canal fillings, much space has been devoted to this subject in order that the shape of the pulp canal in various conditions be presented so as to give the student some idea of what he may expect to encounter in certain teeth.

The author is deeply indebted to Dr. Richard Reithmüller, of the University of Pennsylvania, and Dr. For-

PREFACE

rest D. Orton, of the University of Minnesota, for valuable aid in furnishing illustrations showing various pulp canals. The radiographs of the pulp canals were made especially for the author by Dr. E. H. Skinner from a normal set of teeth furnished the author by Dr. George F. Moffatt. The illustrations of the permanent teeth were made from a skull in the author's collection, which possessed normal occlusion. Especial credit is due the artist, Mr. Ivan F. Summers, for the skill displayed in the production of the illustrations. His untiring efforts to faithfully accomplish his task is appreciated and the author takes this opportunity to express his gratitude.

The drawings of the deciduous teeth may be said to be composite. They have been made from various illustrations in the author's possession and from observations made upon models obtained in the practice of orthodontia. It would have been more satisfactory to have had a perfect set of deciduous teeth all taken from the same mouth, but thus far the author has been unable to secure such a specimen.

This book is presented with the hope that it will be found valuable to those interested in the study of dental anatomy, and especially teachers in dental schools and members of the dental profession.

M. D.

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DENTAL ANATOMY

CHAPTER I.

GENERAL CONSIDERATIONS.

Teeth are hard calcified substances, placed in the oral cavity primarily for the purpose of securing and masticating food. They are divided into incisors, canines, or cuspids, premolars, or bicuspid, and molars. Incisors are located in the anterior portion of the oral cavity, and are known as the first and second, or central and lateral incisors, are situated on the right and left side, and present a sharp cutting edge for cutting the food or for incision. The canines are located posterior or distal to the incisors and are conical shaped with a sharp point and are used for prehension. The canine in the upper arch is located in the superior maxillary bone. The corresponding tooth below is called the lower canine. In the permanent set of teeth the premolars, or bicuspid, are located distally to the canines and are known as the first and second premolars, or bicuspid. They are called bicuspid because as a rule they possess two cusps. The molars are large grinding teeth located posterior to the premolars, or bicuspid, and have no deciduous successors. They have broad occlusal surfaces for masticating food.

Man possesses two sets of teeth, deciduous and permanent. The permanent set are thirty-two in number, comprising four incisors, two canines, or cuspids, four premolars, or bicuspids, and six molars in each jaw. The dentition of man or any animal may be expressed by a dental formula which is written by using the initial letter of each tooth to distinguish the teeth and then writing the numbers of the upper teeth above and the lower teeth below a horizontal line in the same manner as fractions are written. The dental formula of the permanent teeth of man is expressed as follows:

$$\begin{array}{c} \text{Permanent Set} \\ \hline \text{I} \frac{2}{2} \text{C} \frac{1}{1} \text{PM} \frac{2}{2} \text{M} \frac{3}{3} = 16 \end{array}$$

$$\begin{array}{c} \text{Deciduous Set} \\ \hline \text{I} \frac{2}{2} \text{C} \frac{1}{1} \text{M} \frac{2}{2} = 10 \end{array}$$

The formula reads: incisors, two uppers and two lowers; canines, one upper and one lower; premolars, two uppers and two lowers; and molars, three uppers and three lowers. These represent the teeth on one side of the arch. The deciduous set is made up of two incisors, one canine, and two molars on each side of the arch—ten teeth in each jaw, making twenty teeth in the upper and lower set. It will be observed that in the deciduous set there are no premolars, as the deciduous molars are replaced by the premolars. Each tooth is made of four tissues, the enamel, which covers the crown, the dentine forming the body of the crown and root, the cementum, which covers the dentine of the root to which the periodontal

membrane is attached, and the pulp tissue, which fills the pulp canal. As the description of these dental tissues belongs to histology, they will not be described in this work. Each tooth presents, for study, a crown which is that portion of the tooth above the cementum, or above the attachment of the peridental membrane. The root is that portion of the tooth, in the human, covered with cementum, and to which the peridental membrane is attached. The peridental membrane is that tissue which supports the tooth in the alveolus and covers the root occlusally to the dento-enamel junction, and supports the soft tissues around the neck. The crown is covered with enamel and the root with cementum. The body of the tooth is composed of dentine. The pulp cavity is a space within the tooth, containing the dental pulp or nerve. The root may be a single prong as in the incisors and canines or cuspids, or it may be divided into two prongs as in the lower molar or first premolar, or into three prongs as in the upper molars, or into a greater number in exceptional cases.

For convenience, the root may be divided into three parts. The gingival is that portion near the neck of the tooth or that portion situated above the alveolus. The alveolar portion or body is that portion extending from the tip of the alveolar process to practically the end of the root, while the extreme end of the root is known as the apex. That portion of the tooth at the junction of the crown and root is known as the neck. That

portion of the crown near the neck is known as the gingival portion of the crown, while the portion of the root near the neck is known as the gingival portion of the root. Therefore, the gingival portions of the crown and root are in contact, or join with each other. The junction of the crown and the root is generally marked by a ridge in the enamel, which is known as the gingival line, or ridge. This line passes around the tooth at its neck and is concave or convex on different surfaces. On most of the proximate surfaces, the gingival line is curved so as to make a convexity towards the crown, while the buccal and lingual sides are curved so as to make a convexity towards the root. These curvatures are known as the gingival curvatures of the gingival line.

The crowns of the incisors and canines present for examination a cutting edge and four surfaces—buccal, lingual, mesial and distal. The premolars, or bicuspids, and molars present five surfaces, buccal, lingual, mesial, distal, and occlusal. The buccal surface of molars and premolars is that surface towards the cheek, corresponding to the labial surface of the incisors and canines. The lingual surface of molars, premolars, canines, and incisors, is the surface which lies inside the buccal cavity. The mesial surface of all teeth is that surface which approaches the median line. Therefore, in the central incisors from the right and left side, the mesial surface of the two central incisors approximate each other. The distal surface

is that surface of the tooth farthest away from the median line. The distal surface is the posterior surface of the tooth. The occlusal surface of the molars and premolars is that surface which occludes or antagonizes with the teeth of the opposing arch. The cutting edge of the incisors and canines is that surface which also antagonizes with the surface of the opposing teeth during the

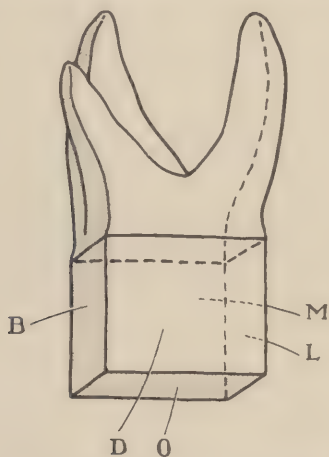


Fig. A.—Surfaces of teeth. B, Buccal surface; D, Distal surface; M, Mesial surface; L, Lingual surface; O, Occlusal surface.

process of incision. The surfaces of the teeth which touch each other in the same arch are known as proximate surfaces, or are sometimes called proximal surfaces. The proximate surfaces of the teeth are therefore the mesial and distal surfaces. The mesial and distal surfaces of most teeth are convex, with the result that only a small portion of the surface touches the proximating

tooth; therefore, those points which touch each other are known as proximate contact points.

For the purpose of description, the crown of the tooth may be divided as follows: the occlusal surface which is that portion of the tooth occluding with the tooth of the opposing arch, and the gingival portion which is that part of the crown which unites with the root. The crown is divided occluso-gingivally into the occlusal third, gingival third, and central third. The tooth may also be divided bucco-lingually into the buccal third, lingual third, and central third. It may likewise be divided mesio-distally, into the mesial third, distal third, and central third. The buccal surface, therefore, would be divided into nine parts by imaginary lines, running mesio-distally and occluso-gingivally. The above parts are distinguished as the mesio-occlusal, central occlusal, and disto-occlusal; the mesial central, central, and distal central; the mesio-gingival, gingival central, and disto-gingival. The mesial, distal, lingual, and occlusal surfaces could be similarly divided. The mesial and distal surfaces are divided into incisal or occlusal third, middle third, and gingival third; bucco-lingually, into buccal third, middle third, and lingual third. The occlusal surface is divided mesio-distally into mesial third, middle third, and distal third; bucco-lingually, into buccal third, middle third, and lingual third. The cutting edges of the incisors and canines are divided mesio-distally only, and the divisions are mesial third, middle third, and distal third. The incisors

present a cutting edge made up by the junction of the labial and lingual surfaces forming a line. The labial and lingual surfaces of the canines, or cuspids, also join so as to form a line, and the middle portion of the line is elongated incisally to a cusp, consequently the cutting edge is divided into a mesio-incisal and disto-incisal edge. The incisors and cuspids of the upper arch do not

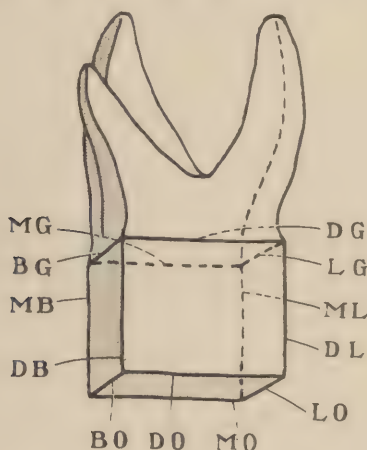


Fig. B.—Line angles or margins of teeth. MG, Mesio-gingival; BG, Bucco-gingival; MB, Mesio-buccal; DB, Disto-buccal; BO, Bucco-occlusal; DO, Disto-occlusal; MO, Mesio-occlusal; LO, Linguo-occlusal; DL, Disto-lingual; ML, Mesio-lingual; LG, Labio-gingival; DG, Disto-gingival.

occlude, or strike entirely on the cutting edge of the lower incisors and canines, but extend over them on the labial side so as to bring the cutting edges in apposition with each other in the same manner as the blades of scissors pass during the act of cutting. The occlusal surfaces of the molars and premolars, or bicuspids, strike with each

other directly and form a large masticating or crushing surface. The occlusal surface of the premolars, or bicuspid, generally presents two cusps, but, in some instances, there may be one or three cusps. The occlusal surface of the molars generally presents four cusps, but, in some instances, there are five or more.

The union of the surfaces of the teeth forms angles, known as line angles. Where two surfaces come together, a line angle is formed. For example, the junction of the buccal with the occlusal surface of the molar forms a line angle of the buccal surface, or a line angle of the occlusal surface, or a bucco-occlusal line angle of the crown. The edges of the surfaces of the incisors coming together form line angles in the same manner. For instance, the union of the labial with the mesial surface of the incisor forms the mesio-labial angle and extends from the cutting edge to the gingival portion of the crown. The union of the distal and labial surfaces forms the disto-labial line angle, and the distal with the lingual forms the disto-lingual line angle, while the mesial with the lingual forms the mesio-lingual line angle. Line angles are named by making a compound word out of the terms which describe the surface of the tooth. The union of the mesial with the lingual surface of the lower molar, or bicuspid, is known as the mesio-lingual line angle, and the other angles would be the mesio-buccal, mesio-occlusal, and mesio-gingival. The line angles, which run parallel to the long axis of the tooth are

known as axial line angles. Bicuspids and molars having an occlusal surface present four occlusal line angles, which are formed by the junction of the occlusal surface with the other four surfaces. They are named the bucco-occlusal, disto-occlusal, mesio-occlusal, and linguo-occlusal line angles. The point angles of premolars, or bicuspids, and molars are made by the junction of three surfaces. There are four occlusal and four gingival point angles. The junction of the mesial, buccal, and the occlusal surfaces with each other form the mesio-bucco-occlusal line angle of the tooth. The other occlusal line angles are named the mesio-linguo-occlusal, disto-bucco-occlusal, and the disto-linguo-occlusal angles, formed respectively by the three surfaces, which unite at these points. The gingival line angles are named in the same way, and are known as the mesio-bucco-gingival, disto-bucco-gingival, disto-linguo-gingival, and the mesio-linguo-gingival line angles. The incisors and canines have the same gingival angles as the molars and premolars, but, owing to the fact that the labial and lingual surfaces approach each other, there are really but two incisal angles known as the mesio-incisal and disto-incisal, which represent the termination of the mesial and distal surfaces with the labial and lingual. Any surface of a tooth considered alone is described as having marginal ridges, or line angles and point angles peculiar to itself. Each margin or line angle is designated by the name of the surface to which it is joined and towards which it faces. For

example, the buccal surface of a molar would possess the following line angles: the occlusal, which would be the junction of the buccal and the occlusal surface; the mesial and distal, which would be the junction of the buccal with the mesial and distal surfaces; the gingival, which would be that portion at the gingival border of the crown. The labial surface of the incisor would have a gingival marginal line angle, a mesial marginal line angle, a distal marginal line angle, and an incisal marginal line angle. The mesial or distal surface of the molar or bicuspid would present an occlusal margin or line angle, a buccal margin or line angle, a lingual margin or line angle, and a gingival margin or line angle. The mesial and distal surfaces of the incisors and canines, or cuspids, are triangular in form, and therefore have only three margins, the gingival, labial and lingual.

The surfaces of a tooth also present angles, which are formed by the junction of line angles, and are known as point angles of that surface. Therefore, the point angles of a buccal surface of a molar are the mesio-occlusal, disto-occlusal, mesio-gingival, and disto-gingival. It will be observed that the mesio-occlusal point angle of the buccal surface is also the mesio-bucco-occlusal angle of the crown. The disto-occlusal angle of the buccal surface is the disto-bucco-occlusal angle of the crown. It will also be noted that the mesio-occlusal angle of the buccal surface and the mesio-buccal angle of the occlusal surface are the same point angle of the crown. In other words, the

point angles of the three surfaces form one point angle of the crown. For example, the mesio-occlusal angle of the buccal surface and the mesio-buccal angle of the occlusal surface, and the bucco-occlusal angle of the mesial surface are the same as the mesio-bucco-occlusal angle of the crown. The occlusal surfaces of molars and premolars are marked by cusps, which are elevations on the

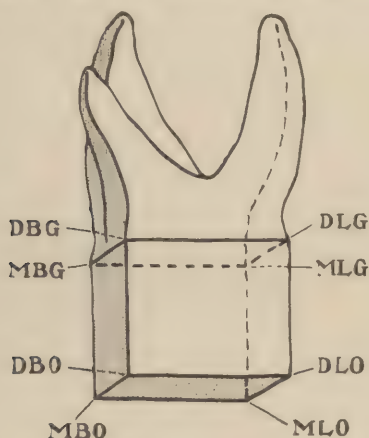


Fig. C.—Point angles of teeth. DBG, Disto-bucco-gingival; MBG, Mesio-bucco-gingival; DBO, Disto-bucco-occlusal; MBO, Mesio-bucco-occlusal; DLG, Disto-linguo-gingival; MLG, Mesio-linguo-gingival; DLO, Disto-linguo-occlusal; MLO, Mesio-linguo-occlusal.

occlusal surface. A tubercle is a slight elevation near the gingival margin, or somewhere beside the occlusal surface, and is generally found on the lingual surface of the upper incisors. The cusps of teeth are formed by ridges, which are termed marginal, triangular, and buccal, or lingual. The marginal ridges are those elevations of the enamel making the margin of the occlusal sur-

faces of the premolars, or bicuspid, and molars. The buccal and lingual marginal ridges enter into the formation of the buccal and lingual cusps of the premolars and molars. The lingual surfaces of the incisors are also marked by elevations in the enamel, known as the mesial and lingual marginal and the gingival marginal ridges. The marginal ridges, extending from the tip of the cusps of the molars and premolars mesially and distally are known as the mesio-occlusal marginal ridge and disto-occlusal marginal ridge of the cusp. The ridge of the enamel, extending from the tip of the cusp towards the central fossa of the molars and premolars is known as the triangular ridge. It is so called because it is usually triangular in form as a result of the arrangement of the grooves which originate in the central fossa.

On the buccal cusp of molars and premolars we find a ridge running from the tip of the cusp bucco-lingually known as the buccal ridge of the respective cusp. On the lingual cusp of molars and premolars a ridge of enamel runs from the tip of the cusp linguo-lingually and is known as the lingual ridge.

The surfaces of a great many teeth are marked by irregularities or angular depressions known as fossæ. Fossæ occur mostly on the occlusal surfaces of molars, on the lingual surfaces of upper incisors, and, occasionally, on canines. A long shaped depression in the surface of a tooth is called the sulcus. Some sulci pass mesio-distally entirely through the occlusal surface as in bicus-

pids and molars. A small long shaped depression in the form of a line on the surface of the tooth is called a groove. When such a groove follows the bottom of a sulcus it is said to be a sulcate groove. When the groove becomes so deep as to become a separation in the surface of the enamel or a break in the enamel surface between the rods of the enamel, it is known as a fault or fissure.

Grooves which mark the junction of the enamel during the process of calcification or the place where two points of calcification unite are known as developmental grooves. Developmental grooves separate the tooth from the different divisions which are known as lobes, each lobe representing a different point of calcification. Some of the teeth of man are represented by three, four, or five developmental lobes. As result of these grooves which separate the lobes a great amount of the description of a tooth is dependent upon the direction in which these developmental grooves run. In cases of improper union at different points of development, these grooves are subject to fissures, which are breaks in the enamel or the failure of a perfect union, and are therefore called "fault." In addition to developmental grooves, a number of supplemental grooves may be found which are really wrinkles occurring on the surface of the enamel during the process of calcification. These supplemental grooves are also influenced by the formation of ridges and in some instances are so prominent as to require description. For example, the mesio-bucco-triangular, the mesio-

linguo-triangular, or other triangular grooves of the occlusal surface of the molars are really supplementary grooves which have to be described in giving the description of the occlusal surface. The crowns of teeth are said to have three diameters, the ocluso-gingival diameter, mesio-distal diameter, and the bucco-lingual diameter. As a rule the molars are larger in the mesio-distal diameter than in either of the other two. The points at which the mesio-distal surfaces come in contact with each other are called the proximate contact points. Owing to the fact that the mesial and distal surfaces of the teeth are convex bucco-lingually, V-shaped spaces are formed on the buccal and lingual side of the proximate contact points known as the buccal and lingual embrasures. Likewise, as the proximate surfaces touch each other nearer to the occlusal than the gingival margin and the mesio-distal diameter of the tooth is greater at the occlusal third than at the gingival third, we have a V-shaped space between the gingival portion of the teeth and a proximate contact point, known as the inter-proximate space. The diameters of the various teeth differ in individuals and we have various shaped proximate spaces and also various shaped inter-proximate embrasures.

The inter-proximate embrasures differ from each other on the buccal and lingual sides, the buccal embrasures being a shorter triangle than the lingual embrasure which in itself is a long pointed triangle. Some teeth are very long and slender, with the occlusal diameter much greater than the

gingival diameter, while others are thick at the gingival portion, with the gingival diameter nearly as great as the occlusal diameter.

The length of the cusps differ in individuals, some having long and others short cusps. Some will be dull, marked with grooves and ridges, while still others will be comparatively smooth.

MEASUREMENTS OF THE TEETH.

The teeth of man can be measured in various directions for the purpose of study and certain terms are applied to these measurements. In measuring extracted teeth and those in the mouth, different rules have to be followed with different portions of the tooth measured. It is almost impossible to measure the root of a tooth in a living individual. Teeth are measured in the following directions, as suggested by Black:

First, the length over all represents the length of the tooth from the cutting edge of the tip of the buccal cusp to the apex of the root.

Second, the length of the crown represents the diameter of the crown from the cutting edge of the buccal cusp to the gingival line on the labial or buccal surface.

Third, the length of the root is that length from the gingival line on the buccal surface to the apex of the root.

Fourth, the mesio-distal diameter of the crown is the distance from the mesial surface to the dis-

tal surface through the greatest diameter which is generally at the point of the proximate contact.

Fifth, the mesio-distal diameter of the neck represents the distance from the mesial to the distal surface of the gingival line.

Sixth, the labio-lingual or bucco-lingual diameter is the greatest diameter of the crown, either on the labial or buccal side from the cutting or occlusal borders of the gingival line of the tooth taken at the greatest point, which is generally through the buccal cusp. This represents the greatest diameter from the buccal or labial to the lingual; in incisors and canines it is nearest the gingival ridge and in molars and premolars is nearer the gingival portion of the crown or nearer the point of the greatest convexities of the buccal and lingual surface.

Seventh, the curvature of the gingival line. This measurement represents the height or extent of the curve of the gingival line towards the cutting edge as the gingival line passes lingually and labially, measured on the mesial and distal surface.

The tables of measurements here given are arranged the same as the measurements by Black, but vary some in the extremes.

MEASUREMENTS OF THE TEETH—UPPER

Table of Measurements of the Teeth of Man, given in millimeters and tenths of millimeters		Length over all	Length of Crown	Length of Root	Mesio-distal diameter of Crown	Mesio-distal diameter of Neck	Labio- or buccolingual diameter	Curvature of gingival line
CENTRAL INCISOR	Average.	22.5	10.0	12.0	9.0	6.3	7.0	3.0
	Greatest.	27.5	12.3	16.2	10.5	7.5	8.5	4.5
	Least....	17.5	7.7	7.8	7.5	5.0	6.5	1.5
LATERAL INCISOR	Average.	22.0	8.8	13.0	6.4	4.4	6.0	2.8
	Greatest.	26.5	10.8	16.2	7.5	5.5	7.5	4.5
	Least....	16.5	7.7	7.8	4.5	3.5	4.5	1.5
CUSPID	Average.	26.5	9.5	17.3	7.6	5.2	8.0	2.5
	Greatest.	32.5	12.3	20.7	9.5	6.5	9.5	4.0
	Least....	19.5	7.7	10.8	6.5	3.5	6.5	.5
FIRST BICUSPID	Average.	20.6	8.2	12.4	7.2	4.9	9.1	1.1
	Greatest.	23.0	9.3	14.2	8.5	6.5	10.5	2.5
	Least....	16.5	6.7	9.8	6.5	3.5	7.5	0.0
SECOND BICUSPID	Average.	21.5	7.5	14.0	6.8	5.3	8.8	.8
	Greatest.	27.5	9.3	19.2	8.5	7.0	10.5	1.5
	Least....	15.5	6.7	9.8	5.5	4.0	7.0	0.0
FIRST MOLAR	Average.	20.8	7.7	13.2	10.7	7.5	11.8	2.2
	Greatest.	24.5	9.3	16.2	12.5	8.5	12.5	3.3
	Least....	16.5	6.7	9.8	8.5	6.5	10.5	.7
SECOND MOLAR	Average.	20.0	7.2	13.0	9.2	6.7	11.5	1.6
	Greatest.	24.5	8.3	17.2	10.5	8.5	13.0	4.3
	Least....	15.5	5.7	8.8	6.5	5.5	9.5	0.0
THIRD MOLAR	Average.	17.1	6.3	11.4	8.6	6.1	10.6	0.7
	Greatest.	22.5	8.3	15.2	11.5	8.5	15.0	2.5
	Least....	13.5	4.7	7.8	6.5	4.5	7.5	0.0

MEASUREMENTS OF THE TEETH—LOWER

Table of measurements of the teeth of Man, given in millimeters and tenths of millimeters		Length over all	Length of Crown	Length of Root	Mesio-distal diameter of Crown	Mesio-distal diameter of Neck	Labio- or buccolingual diameter	Curvature of gingival line
CENTRAL INCISOR	Average.	20.7	8.8	11.8	5.4	3.5	6.0	2.5
	Greatest.	24.5	10.8	16.2	6.5	5.5	7.0	3.3
	Least....	15.5	6.7	8.8	4.5	2.0	5.0	1.2
LATERAL INCISOR	Average.	21.1	9.6	12.7	5.9	3.8	6.4	2.5
	Greatest.	27.5	12.3	17.2	7.0	5.5	8.0	3.8
	Least....	17.5	6.7	10.8	4.5	2.5	5.5	1.7
CUSPID	Average.	25.6	10.3	15.3	6.9	5.2	7.9	2.9
	Greatest.	33.0	12.3	21.2	9.5	7.5	10.5	4.3
	Least....	19.5	7.7	10.8	4.5	2.5	6.0	1.7
FIRST BICUSPID	Average.	21.6	7.8	14.0	6.9	4.7	7.7	0.8
	Greatest.	26.5	9.3	18.2	8.5	5.5	8.5	1.8
	Least....	17.5	6.2	10.8	5.5	4.0	6.5	0.2
SECOND BICUSPID	Average.	22.3	7.9	14.4	7.1	4.8	8.0	.6
	Greatest.	26.5	10.3	17.7	8.5	7.0	9.5	2.3
	Least....	17.5	5.7	11.3	6.0	3.5	6.5	0.0
FIRST MOLAR	Average.	21.0	7.7	13.2	11.2	8.5	10.3	1.1
	Greatest.	24.5	10.3	15.2	12.5	10.0	12.0	2.3
	Least....	17.5	6.7	10.8	10.5	7.0	9.5	0.0
SECOND MOLAR	Average.	19.8	6.9	12.9	10.7	8.1	10.1	0.2
	Greatest.	22.5	8.3	14.2	11.5	9.0	11.0	1.0
	Least....	17.5	5.7	11.8	9.5	7.5	9.0	0.0
THIRD MOLAR	Average.	18.5	6.7	11.8	10.7	8.3	9.8	0.2
	Greatest.	20.5	8.3	17.2	12.5	10.0	11.0	1.5
	Least....	15.5	5.7	7.8	7.5	4.5	8.5	0.0

MEASUREMENTS OF THE TEETH—Upper and Lower
(Averages Only)

Table of measurements of the Deciduous Teeth of Man, given in millimeters and tenths of millimeters	Length over all	Length of Crown	Length of Root	Mesio-distal diameter of Crown	Mesio-distal diameter of Neck	Labio-lingual diameter of Crown	Labio-lingual diameter of Neck
UPPER TEETH							
CENTRAL INCISOR ..	16.0	6.0	10.0	6.5	4.5	5.0	4.0
LATERAL INCISOR...	15.8	5.6	11.4	5.1	3.7	4.8	3.7
CUSPID.....	19.0	6.5	13.5	7.0	5.1	7.0	5.5
FIRST MOLAR.....	15.2	5.1	10.0	7.3	5.2	8.5	6.9
SECOND MOLAR	17.5	5.7	11.7	8.2	6.4	10.0	8.3
LOWER TEETH							
CENTRAL INCISOR ..	14.0	5.0	9.0	4.2	3.0	4.0	3.5
LATERAL INCISOR...	15.0	5.2	10.0	4.1	3.0	4.0	3.5
CUSPID.....	17.0	6.0	11.5	5.0	3.7	4.8	4.0
FIRST MOLAR.....	15.8	6.0	9.8	7.7	6.5	7.0	5.3
SECOND MOLAR	18.8	5.5	11.3	9.9	7.2	8.7	6.4

CHAPTER II.

INCISORS.

UPPER CENTRAL INCISOR.

The upper central incisor is the first tooth in the upper arch from the median line, and it approximates its fellow on the opposite side. There are two upper central incisors, named, respectively, the upper right and left central incisor, or the upper first incisors. The tooth presents, for examination, the crown and root; the crown only being visible in the mouth. The crown has four surfaces—labial, lingual, mesial, and distal, and one incisal edge which is formed by the junction of the labial and lingual surfaces. The crown of the tooth, therefore, is wedge-shaped; the mesial and distal surfaces being triangular, with the base of the triangle at the gingival margin. The labial and lingual surfaces are bounded by four line angles and four point angles, while the mesial and distal surfaces are bounded by three line angles and three point angles.

Labial Surface.

The labial surface of the central incisor is a modified rectangle, being bounded by four line angles and four point angles. Two point angles (Fig. 1), mesio-incisal and disto-incisal, are quite pointed; the mesio-incisal angle is an acute angle,

while the disto-incisal angle is an obtuse angle. The mesio-lingual angle and the disto-lingual

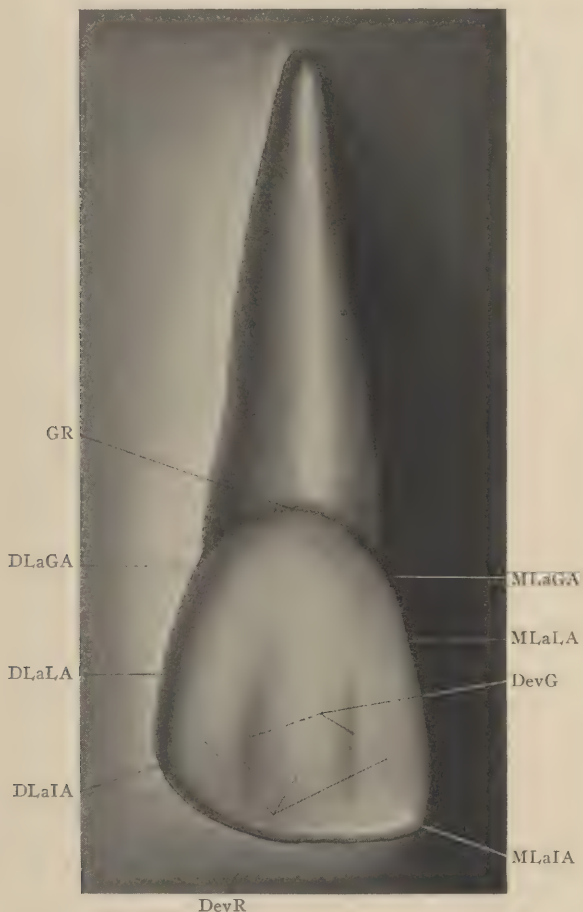


Fig. 1.—Labial surface of the upper right central incisor. GR, Gingival ridge; DLGa, Disto-labio-lingual angle; DLaLA, Disto-labial line angle; DLIA, Disto-labio-incisal angle; DevR, Developmental ridges; MLaIA, Mesio-labio-incisal angle; DevG, Developmental grooves; MLaLA, Mesio-labial line angle; MLaGA, Mesio-labio-lingual angle.

angle of the labial surface are well rounded. The line angles, named the incisal, distal, mesial and gingival may be described as follows: The incisal angle is very nearly straight, extending from the acute mesio-incisal angle of the labial surface to the obtuse disto-incisal angle. The mesial line angle is longer than the distal line angle, and both mesial and distal line angles are slightly convex, with the convexity towards the proximating teeth. The gingival line angle is also convex, with the convexity towards the apex of the tooth. The labial surface is convex in all directions, both ocluso-gingivally and mesio-distally. The labial surface, mesio-distally, has the greatest convexity near the mesial and distal thirds, while near the center the labial surface has a tendency to become almost flat, which is especially the case in old worn teeth. Ocluso-gingivally, the greatest amount of convexity is at the gingival third, which gradually becomes less as we approach the incisal border.

The labial surface is marked by three developmental ridges and two developmental grooves which run ocluso-gingivally. In the majority of the central incisors, the mesial and distal developmental ridges are the largest, consequently the central developmental ridge, or lobe, is the smallest of the three. As a result, the developmental grooves are nearer the middle third of the tooth than the mesial and distal third.

Lingual Surface.

The lingual surface of an upper central incisor presents the same line angles and point angles

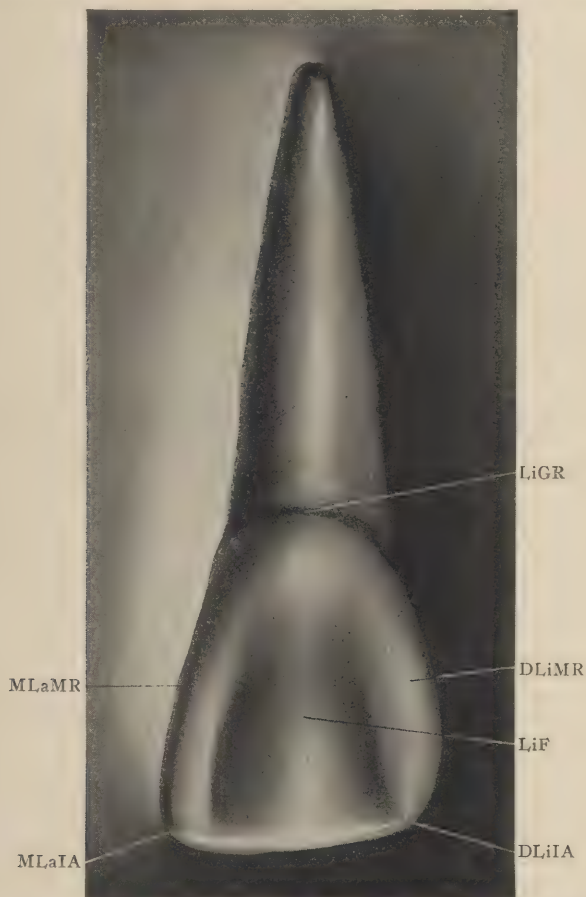


Fig. 2.—Lingual surface of the upper right central incisor. MLaMR, Mesio-labial marginal ridge; MLaIA, Mesio-labio-incisal angle; DLiIA, Disto-linguo-incisal angle; LiF, Lingual fossa; DLiMR, Disto-lingual marginal ridge; LiGR, Linguo-gingival ridge.

as the labial surface (Fig. 2). The developmental grooves and ridges are slightly different, and we have the mesial, distal, and gingival margins of the lingual surface developed into well formed ridges. These are the mesio-lingual marginal ridge, the disto-lingual marginal ridge, and the linguo-gingival marginal ridge, shown in Fig. 2. As a result of the well developed mesio-lingual marginal, disto-lingual marginal, and linguo-gingival marginal ridges, there is a tendency for the formation of a lingual fossa, as illustrated in Figs. 2 and 5. Passing from the gingival border of the lingual surface to the incisal edge near the central portion of the tooth, we find the gingival third decidedly convex and the remaining two-thirds markedly concave. Mesio-distally, the tooth is convex in all directions near its gingival third. In an examination of the lingual surface proximating the ocluso-incisal center, a decided convexity is found near the mesial and distal margin, and also a concavity in the center. This concavity is the lingual fossa, while the convexity is the mesio- and disto-lingual marginal ridges. In a great many teeth, the central lobe of the central incisor is developed to such an extent as to form a slight ridge, ocluso-gingivally, on the lingual side of the tooth, thereby crossing the lingual fossa of the tooth, and making two slight developmental grooves as shown in Fig. 2.

Mesial Surface.

The mesial surface of an upper central incisor, shown in Fig. 3, is triangular, the base of the tri-

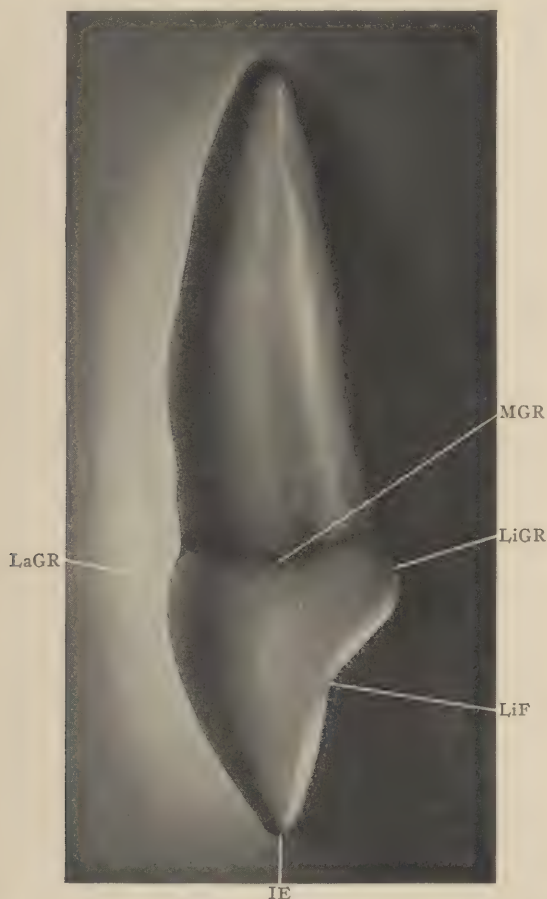


Fig. 3.—Mesial surface of the upper right central incisor. LaGR, Labio-gingival ridge; IE, Incisal edge; LiF, Lingual fossa; LiGR, Linguo-gingival ridge; MGR, Mesio-gingival ridge.

angle being the gingival marginal ridge, which is concave, with the concavity towards the apex of the root. The labial border of the mesial surface, occluso-gingivally, is slightly convex the entire distance, with the greatest amount of convexity near the gingival third. The lingual margin of the mesial surface of the central incisor, occluso-incisally, is at first convex near the gingival border, and then becomes concave in the incisal two-thirds to correspond with the lingual fossa of the tooth. Labio-lingually, the mesial surface of the central incisor is convex in all directions, except that in some cases a concavity is found at the gingival third. The mesial surface of the tooth, occluso-gingivally, is also slightly convex in all directions, but there is often a concavity at the gingival third. The greatest convexity of the mesial surface is near the junction of the middle and incisal thirds of the tooth, forming a round surface known as the proximate contact point. At this point the central incisor approximates with its fellow on the opposite side.

Distal Surface.

The distal surface of the central incisor (Fig. 4) has the same general outline as the mesial surface, except that the distance from the gingival to the incisal angle is less. Owing to the fact that the incisal edge has a tendency to run gingivally, the disto-incisal angle of the tooth is more of an obtuse angle than the mesio-incisal angle. The

distal surface of a central incisor presents a greater amount of convexity in all directions, but there is often a concavity on the distal surface

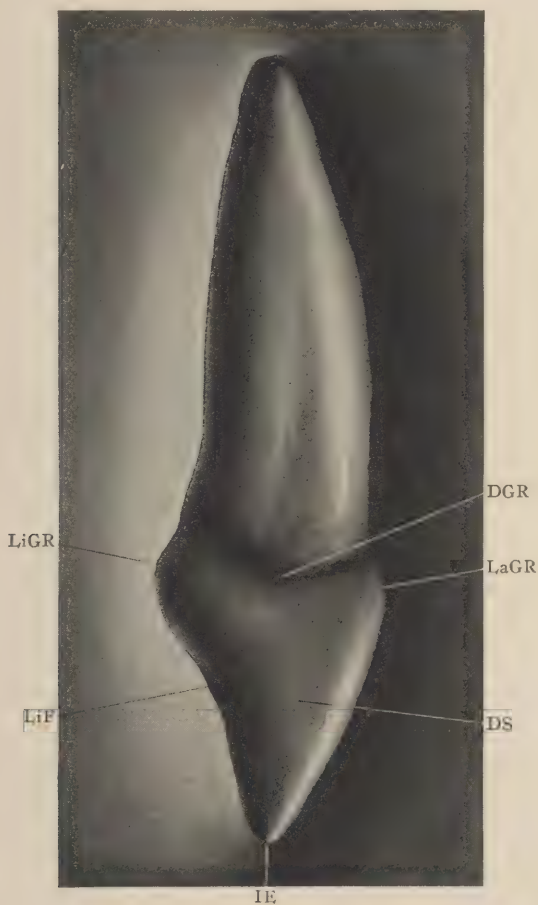


Fig. 4.—Distal surface of the upper right central incisor. LiGR, Linguo-gingival ridge; LiF, Lingual fossa; IE, Incisal edge; DS, Distal surface; LaGR, Labio-gingival ridge; DGR, Disto-gingival ridge.

near the gingival third. Owing to the amount of convexity on the distal surface of the upper central incisor, the proximate contact point lies nearer the middle of the tooth than it does on the mesial side. The distal surface has the same line angles and point angles as the mesial surface, i.e., the line angles are named the gingival, lingual, and labial, while the point angles are the labio-gingival, linguo-gingival, and incisal.

Incisal Edge.

The incisal edge of the central incisor is formed by the junction of the lingual and labial surfaces of the tooth. Owing to the manner in which the lingual and labial surfaces approach each other, the incisal edge of the tooth is nearly in line with the axis of the root, labio-lingually. When looking directly at the incisal edge of the tooth (Fig. 5) we observe that the labial surface from the incisal edge, gingivally, presents a convexity in all directions. The lingual surface of the tooth, viewed from the incisal edge, presents the lingual fossa, surrounded by the mesio-lingual, disto-lingual, and linguo-gingival marginal ridges. In the central portion of the linguo-gingival ridge, there may be a slight tubercle, or cingulum, which projects incisally. Between the cingulum and lingual surface of the tooth at the most gingival portion of the lingual fossa, there may be a pit, or a defect in the enamel, known as a fissure. Sometimes there will be a fissure extending from the

lingual pit, mesially or distally, across the distal marginal ridge, or mesial marginal ridge, which marks the point of calcification between the linguo-gingival marginal ridge and the mesio-lingual or disto-lingual marginal ridge. In some teeth we may find this groove leading from the gingival portion of the central fossa in both directions, but as a rule the groove is found only on one side.

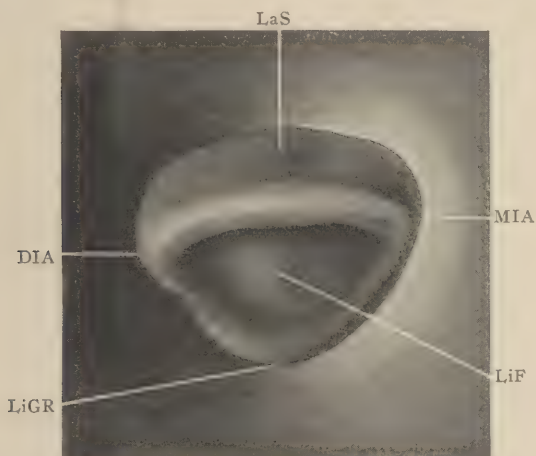


Fig. 5.—Incisal surface of the upper right central incisor. DIA, Disto-incisal angle; LiGR, Linguo-gingival ridge; LiF, Lingual fossa; MIA, Mesio-incisal angle; LaS, Labial surface.

The cutting edge, or incisal edge, of a central incisor is homologous with the occlusal surface of the molars and premolars. In slightly worn teeth the incisal edge may become a decided surface. In newly erupted teeth, the incisal edge is marked by three little papillæ, or mamelons, which mark the mesial, distal, and central devel-

opmental ridges, and which are separated by the mesial and distal developmental grooves.

The Root.

The root of the central incisor is one and a half to two and a half times the length of the crown, and is conical in shape, being reduced in size, gradually, from the gingival border of the tooth to the apex. The labial surface of the root

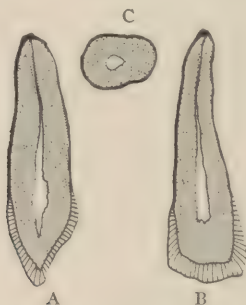


Fig. 6.—Pulp cavity of the upper right central incisor. A, Labio-lingual diameter; B, Mesio-distal diameter; C, Cross section of pulp cavity.

is an arc of a circle. The lingual surface is also an arc of a smaller circle than the labial surface. The labial portion of the root of a central incisor is wider than the lingual portion of the root. The mesial and distal surfaces of the root of the central incisor gradually converge towards each other to the lingual side. The root is generally quite well formed, and nearly straight, although the apex may be curved slightly, owing to difficulties encountered during eruption. The pulp cav-

ity of the central incisor (Fig. 6) follows the general outline of the root. The pulp cavity in the newly developed tooth, from the mesial to the distal side (Fig. 6B) at the incisal portion, presents three little papillæ, which correspond to the three developmental ridges of the tooth, or the three mamelons seen on the labial surface of the newly erupted tooth. The labial and lingual view of the pulp cavity follows the general outline of the tooth, and is wider at the portion corresponding with the gingival marginal ridges of the tooth.

Occlusion.

The upper central (first) incisor occludes with the lower central (first) incisor and the mesiolabial portion of the lower lateral (second) incisor. The upper central (first) incisor proximates on the mesial side with its fellow on the opposite half of the arch, and the distal surface of the upper central (first) incisor proximates the mesial surface of the upper lateral (second) incisor.

Practical Consideration.

The central incisor is the most conspicuous tooth in the mouth, and therefore all restoration and fillings made in the upper central incisor should be anatomically correct from the esthetic viewpoint. Cavities are prone to develop in the mesial and distal side of the central incisor, beginning slightly gingival to the proximate contact point. This probably occurs because of the

fact that there is often a concavity on the mesial and distal side, slightly gingival to the proximate contact point, which forms a suitable place for food to lodge and cause fermentation and decay. The central incisor is generally the first one of the upper permanent incisors to erupt. In making restoration, it must be remembered that the proximate contact on the mesial side is nearer the incisal edge than the proximate contact on the distal side, and that the distal side of the central incisor presents a greater convexity than the mesial. In making any restoration that involves the mesial or distal incisal angle, it should not be forgotten that the mesio-incisal angle is an acute angle and the disto-incisal angle an obtuse angle. Probably nothing will do so much to destroy the esthetic appearance of a filling or inlay as to make the restorations on the mesial and distal side of the central incisor both of the same shape. In any conditions involving the gingival marginal ridge it must be remembered that the function of the gingival marginal ridge is to protect the gingival gum tissue, and especially must the linguo-gingival marginal ridge on the upper central incisor be preserved, because it is the larger of the gingival ridges of the upper incisors and protects the lingual gum tissue from food wedging against it. The gingival marginal ridge on the labial and lingual side of an upper central incisor is convex, with the convexity towards the root, and concave on the mesial and distal side, with the concavity towards the root. This must be remem-

bered in putting ligatures around the tooth, in attaching a rubber dam, in fastening a clamp, or adjusting a regulating appliance. Owing to its prominence the central incisor is more liable than any other tooth to fracture as a result of blows and falls. A fracture of the central incisor may involve the mesial or distal incisal angle, or the entire incisal edge.

LOWER CENTRAL INCISOR.

The lower central (first) incisor is the smallest of the incisor teeth, and likewise the smallest tooth in the mouth. It is the first tooth from the median line in the lower arch, and occupies the same relative position as the upper central (first) incisor. The upper central (first) incisor is the largest in the incisor series, while the lower central (first) incisor is exactly opposite, being the smallest of the incisor teeth. The crown presents four surfaces—labial, lingual, mesial, and distal. The labial and lingual surfaces present four line angles and four point angles; the mesial and distal, three line angles and three point angles. The gingival border of the four surfaces of the crown marks the junction of the crown with the root.

Labial Surface.

The labial surface of the lower central (first) incisor is bounded by the incisal edge, the mesial line angle, the distal line angle and the gingival line angle. The point angles are the mesio-in-

cisal, mesio-gingival, disto-gingival, and disto-incisal. The general outline of the labial surface is a modified rectangle, both the mesio-incisal and the disto-incisal angles being right angles, or slightly more than right angles; acute angles.

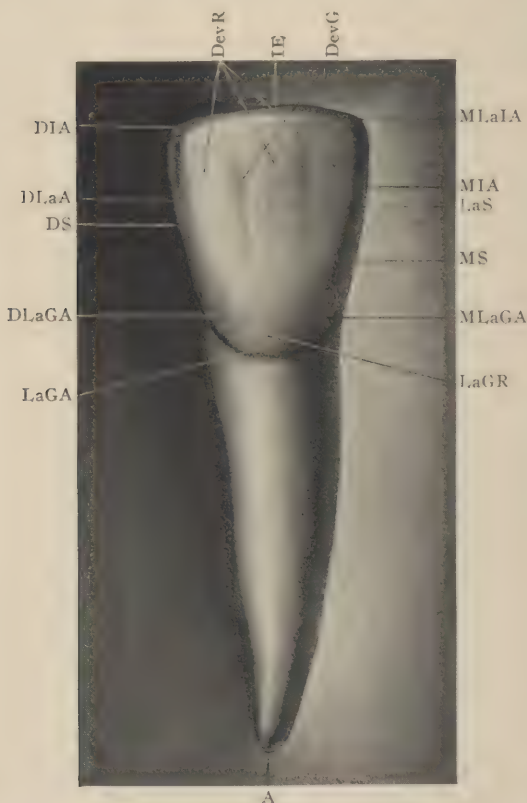


Fig. 7.—Labial surface of the lower right central incisor. DIA, Disto-incisal angle; DLaA, Disto-labial angle; DS, Distal surface; DLaGA, Disto-labio-gingival angle; LaGA, Labio-gingival angle; A, Apex of root; LaGR, Labio-gingival ridge; MLaGA, Mesio-labio-gingival angle; MS, Mesial surface; LaS, Labial surface; MIA, Mesio-incisal angle; MLaIA, Mesio-labio-incisal angle; DevG, Developmental grooves; IE, Incisal edge; DevR, Developmental ridges.

The mesial and distal incisal angles of the labial surface are very nearly equal. The mesial and distal line angles converge almost equally toward the disto-gingival and mesio-gingival point angles. The gingival line angle of the lower central incisor is convex, with the convexity towards the root. The gingival line angle of the labial surface of the central incisors, at the junction of the root, is a well marked ridge which is known as the labio-gingival ridge. The surface of the tooth, inciso-gingivally, is marked by two developmental grooves, which divide the surface of the tooth into three developmental ridges, the central developmental ridge being smaller than the mesial and distal. The labial surface, inciso-gingivally, is slightly convex, with the greatest degree of convexity at the gingival third, near the labio-gingival ridge. The central third of the incisor, inciso-gingivally, may be almost flat. The labial surface of the tooth, mesio-distally, is slightly convex, with the greatest amount of convexity in the region of the mesial and distal fourth. The labio-incisal portion, or the incisal portion of the labial surface, occludes with the linguo-incisal portion of the upper central incisor.

Lingual Surface.

The lingual surface of the lower central incisor presents the same line angles and point angles as the labial surface. The outline of the lingual surface is the same, being a modified rectangle with the mesio-incisal and the disto-incisal angles

of the lingual surface slightly acute, and with the mesio-lingual and the disto-lingual angles of the lingual surface obtuse angles, or angles which are greatly rounded. The lingual surface is

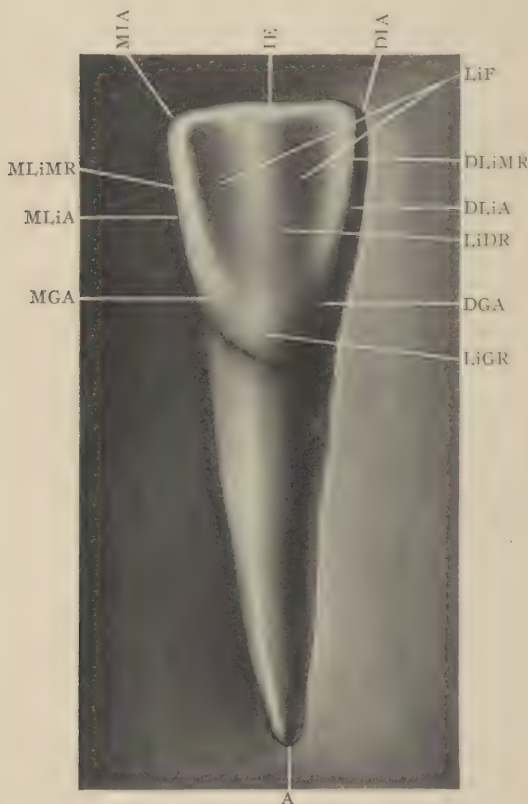


Fig. 8.—Lingual surface of the lower right central incisor. MLiMR, Mesio-lingual marginal ridge; MLiA, Mesio-lingual angle; MGA, Mesio-gingival angle; A, Apex of root; LiGR, Linguo-gingival ridge; DGA, Disto-gingival angle; LiDR, Lingual developmental ridge; DLiA, Disto-lingual angle; DLiMR, Disto-lingual marginal ridge; LiF, Lingual fossa; DIA, Disto-incisal angle; IE, Incisal edge; MIA, Mesio-incisal angle.

marked by three marginal ridges, the mesio-lingual marginal ridge, the disto-lingual marginal ridge, and the linguo-gingival marginal ridge. These ridges extend as follows: Beginning at the mesio-incisal angle, the mesio-lingual marginal ridge passes gingivally and joins the linguo-gingival marginal ridge at the mesio-gingival angle of the lingual surface, then the linguo-gingival marginal ridge, which is slightly convex, passes distally and joins the disto-lingual marginal ridge at the disto-gingival angle of the lingual surface, and the disto-lingual marginal ridge is continued incisally to the disto-incisal angle. These three marginal ridges form a well developed ridge with a decided U-shape on the lingual surface of the tooth, the arms of the U extending towards the incisal edges. The central portion of the linguo-gingival ridge generally develops into a cingulum, and there may be a tendency for a lingual fossa to develop on the lingual surface of the lower central (first) incisor. The lingual fossa on the lower tooth is never as well developed as it is on the upper tooth. The linguo-gingival ridge gradually slopes incisally over the lingual surface, which prevents the formation of a pit or fossa, such as is observed on the upper tooth. The developmental groove can generally be followed on the incisal two-thirds of the lingual surface.

Mesial Surface.

The mesial surface of the lower central (first) incisor is triangular in shape, bounded by three

line angles,—labial, lingual, and gingival, and by three point angles,—mesio-incisal, mesio-labio-gingival and mesio-linguo-gingival. The labial line angle of the mesial surface is convex, with

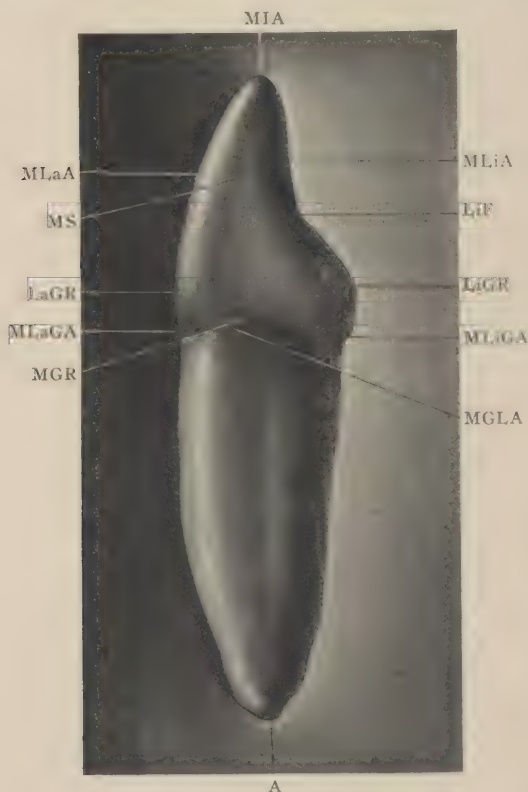


Fig. 9.—Mesial surface of the lower right central incisor. MLaA, Mesio-labial angle; MS, Mesial surface; LaGR, Labio-gingival ridge; MLaGA, Mesio-labio-gingival angle; MGR, Mesio-gingival ridge; A, Apex of root; MGLA, Mesio-gingival line angle; MLIgA, Mesio-linguo-gingival angle; LiGR, Linguo-gingival ridge; LiF, Lingual fossa; MLIa, Mesio-lingual angle; MIA, Mesio-incisal angle.

the convexity toward the labial, and with the greatest amount of convexity in the gingival third. The gingival line angle is concave, with the concavity towards the root. The lingual line angle is at first generally concave in the incisal half or two-thirds, then becomes decidedly convex in the gingival portion. Inciso-gingivally, the mesial surface is convex, with the greatest amount of convexity near the incisal third, and, in some instances, there may be a slight concavity near the gingival third. Labio-lingually, the mesial surface is also greatly convex in the incisal two-thirds, and may be convex in the gingival portion, but there is a slight tendency for the gingival portion of the mesial surface to be flat, or slightly concave. The mesio-gingival ridge is well marked. The mesial surface of the lower central (first) incisor proximates with the mesial surface of the opposite central (first) incisor, which point is known as the proximate contact point.

Distal Surface.

The distal surface of the lower central (first) incisor (Fig. 10) presents the same line angles and point angles and the same concavities and convexities as the mesial surface.

The description of the mesial surface given above will answer very nicely for the distal surface of a normal tooth. In the majority of teeth examined it will be found that the mesial and dis-

tal surfaces are exactly alike, although it is a fact that there is a greater tendency for a concavity to develop in the gingival portion on the distal surface of a lower central incisor than on the mesial surface.

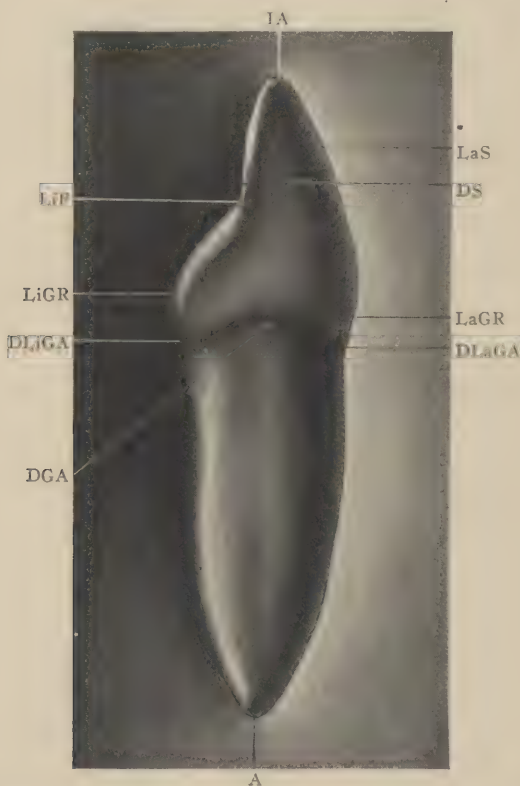


Fig. 10.—Distal surface of the lower right central incisor. LiF, Lingual fossa; LiGR, Linguo-gingival ridge; DLiGA, Disto-linguo-gingival angle; DGA, Disto-gingival angle; A, Apex of root; DLaGA, Disto-labio-gingival angle; LaGR, Labio-gingival ridge; DS, Distal surface; LaS, Labial surface; IA, Incisal angle.

Incisal Edge.

The incisal view of the lower central incisor (Fig. 11) shows that the cutting edge of the tooth, as a rule, is carried a little to the lingual of the center of the tooth. In viewing the tooth directly in the long axis, the labial surface from the in-

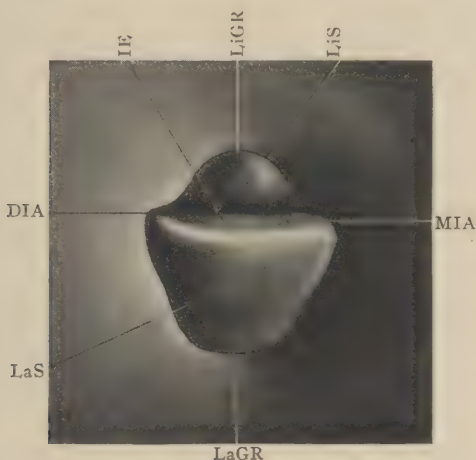


Fig. 11.—Incisal view of the lower right central incisor. DIA, Disto-incisal angle; LaS, Labial surface; LaGR, Labio-gingival ridge; MIA, Mesio-incisal angle; LiS, Lingual surface; LiGR, Linguo-gingival ridge; IE, Incisal edge.

cisal edge gingivally, presents a greater surface than does the lingual portion. It will be found in some central incisors that the cutting edge is carried to the lingual to such an extent as to make a decided concavity in the linguo-incisal third of the lingual surface. The slope of the labial surface, inciso-gingivally, is such as to carry the food down along the labial surface, and

the great amount of convexity of the labial gingival ridge carries the food past the gingival gum tissue.

Pulp Cavity.

The pulp cavity of the lower central incisor follows the same general outline as does the tooth. In newly erupted teeth there are three little papillæ of the pulp cavity, corresponding to the three mamelons which are present on the cutting edge of the lower central incisor when it

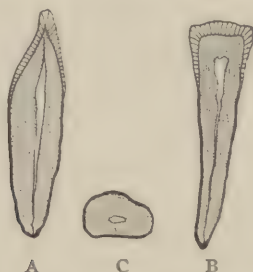


Fig. 12.—Pulp cavity of the lower right central incisor. A, Labio-lingual diameter; B, Mesio-distal diameter; C, Cross section of pulp cavity.

first erupts, marking the junction of three developmental lobes. The pulp cavity in a newly erupted tooth is much larger than in an older one. The accompanying drawing (Fig. 12) was made from the cross section of a tooth taken from a person quite aged. The portion of the pulp cavity is much smaller, mesio-distally (Fig. 12B), than would be the case in a newly erupted tooth. Labio-lingually, Fig. 12A shows that the greatest width of the pulp cavity is in the portion corre-

sponding to the gingival marginal ridge of the crown. The pulp cavity gradually narrows down inciso-gingivally in both directions.

Occlusion.

The lower central incisor occludes with the lingual portion of the upper central incisor. It is the only one of the lower teeth occluding with only one upper tooth.

Practical Consideration.

The lower central incisor, being the smallest of the incisors, necessarily presents a root which is long and narrow, especially narrow mesio-distally; consequently the central incisor is a very difficult tooth to crown with a crown which demands the use of the pulp cavity. The extreme narrowness of the root of the tooth, mesio-distally, renders the wall of the root very liable to perforations when drills and burs are used in the pulp cavity. Fortunately, the root of the lower first incisor is generally straight the entire distance, and is only occasionally curved at the apex. The greatest diameter of the pulp cavity is labio-lingually. The root of the tooth, as shown in Figs. 7, 8, 9, and 10, is conical, gradually tapering towards the apex. There is a tendency for a groove to develop on the mesial and distal side of the root. The tooth is also very liable to be affected with pyorrhea, and deposits which are formed on the mesial and distal side of the root of the lower

central incisor are sometimes very difficult to remove. The tooth is not as liable to injury as the upper central incisor. The crown is not as liable to be fractured, but a blow on the lower central incisor would in all probability displace the tooth lingually before it would fracture the root. A great many cases are on record where the lower central incisor, or, in fact, all the lower incisors have been displaced lingually as the result of blows, because of the extreme narrowness of the root, mesio-distally. Owing to the small size of the crown, it becomes a very difficult matter to secure proper anchorage to hold the fillings and inlays in place. Restoration of the lower central incisor is easier than in the upper incisor because the mesial and distal sides of the tooth are practically of the same shape. The lower central incisor is generally the first one of the lower incisors to erupt, and makes its appearance about the sixth or seventh year. The lingual surface of this tooth, as well as the lingual surface of all of the lower incisors, is a point on the tooth at which the salivary calculus is most liable to form, and is very often the site for the beginning of gingivitis and pyorrhea which develop later. The linguo-gingival ridge of the lower incisor in life, therefore, becomes a vulnerable place as a starting point for gingivitis, and the labial gingival ridge must be preserved for the protection of the gum tissue.

UPPER LATERAL, OR SECOND INCISOR.

The upper lateral, or second incisor, is the second tooth from the median line in the upper arch. It proximates with the distal surface of the upper central, or first incisor, and with the mesial surface of the upper canine. It presents, for

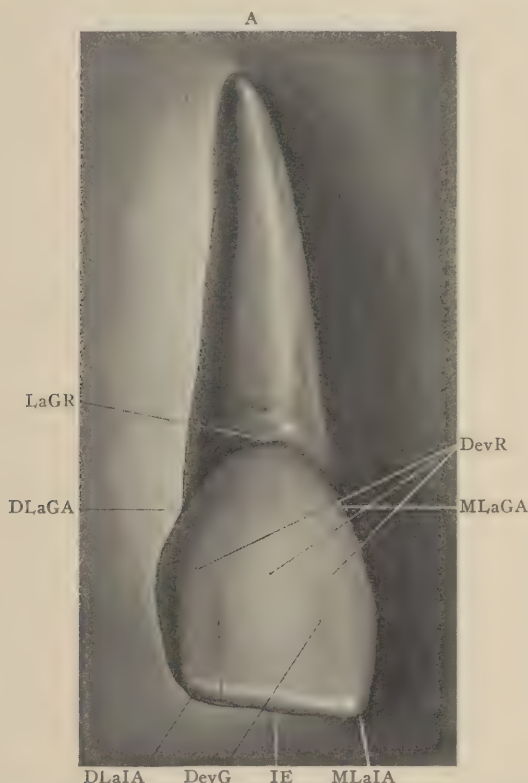


Fig. 13.—Labial surface of the right upper lateral incisor. LaGR, Labio-gingival ridge; DLaGA, Disto-labio-gingival angle; DLaIA, Disto-labio-incisal angle; DevG, Developmental grooves; IE, Incisal edge; MLaIA, Mesio-labio-incisal angle; MLaGA, Mesio-labio-gingival angle; DevR, Developmental ridges; A, Apex of root.

study, the same line angles, point angles, and surfaces as does the central incisor.

Labial Surface.

The labial surface of the upper lateral incisor is more convex mesio-distally than the central, and is smaller in all directions. It is bounded by four line angles, the mesial, incisal, distal, and gingival. The gingival line angle of the labial surface is convex, with the convexity towards the root. The point angles are the mesio-gingival, mesio-incisal, disto-incisal, and disto-gingival. The mesio-incisal angle is more of an acute angle, as a rule, than the mesio-incisal angle of the central, while the disto-incisal angle is more of an obtuse angle. The labial surface is marked by two developmental grooves and three developmental ridges. The incisal edge of the labial surface also presents, in the newly erupted tooth, three tubercles, or mamelons, which mark the three developmental lobes, and which are separated by the two developmental grooves. The mesial line angle of the labial surface is longer than the distal line angle, and is more nearly a straight line from the gingival to the incisal border. The distal line angle from the gingival to the incisal border is decidedly convex.

Lingual Surface.

The lingual surface of the upper lateral incisor presents the same line angles and point angles

as the labial surface. The lingual surface is marked by a concavity known as the lingual fossa, and is bounded by three large marginal ridges, the mesial marginal ridge, distal marginal ridge, and gingival marginal ridge. The gingival end

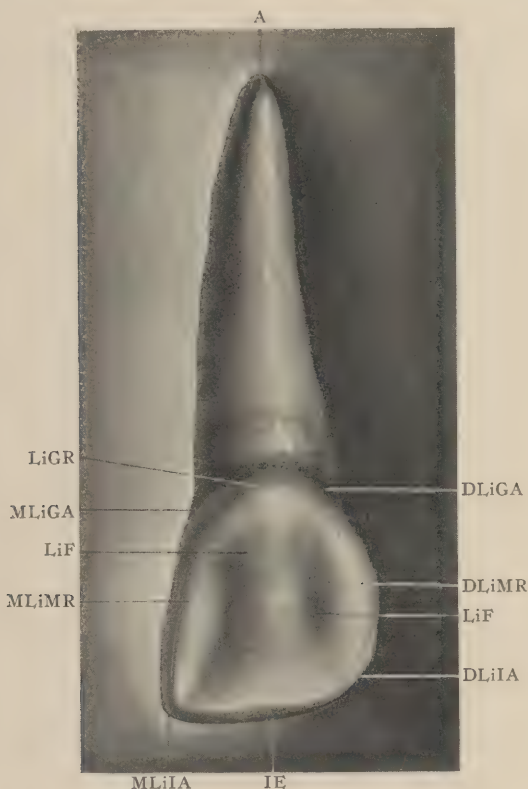


Fig. 14.—Lingual surface of the upper right lateral incisor. LiGR, Linguo-gingival ridge; MLiGA, Mesio-linguo-gingival angle; LiF, Lingual fossa; MLiMR, Mesio-lingual marginal ridge; MLiIA, Mesio-linguo-incisal angle; IE, Incisal edge; DLiIA, Disto-linguo-incisal angle; LiF, Lingual fossa; DLiMR, Disto-lingual marginal ridge; DLiGA, Disto-linguo-gingival angle; A, Apex of root.

of the mesial marginal ridge joins the gingival marginal ridge at the mesio-lingual portion of the lingual surface. The lingual marginal ridge also joins the gingival marginal ridge at the disto-lingual portion of the surface. These three marginal ridges, taken together, form the characteristic letter U, which can be seen on the lingual surface of the lateral incisor, with the arms of the U ending at the mesio-incisal and disto-incisal point angles of the lingual surface. Owing to the fact that the lateral incisor crown is smaller than the central, it gives the marginal ridges the appearance of being stronger and heavier than they are on the central incisor. The lingual surface of the upper lateral is generally slightly wider than the labial surface, so that the proximate surfaces of the tooth join the lingual surfaces at more of a right angle than they join the labial surface. In some cases, the linguo-lingual marginal ridge is a short, well developed ridge, with a tendency to form a cingulum or tubercle on the lingual surface of the tooth. In some cases, the gingival portion of the lingual fossa is a well developed pit, from which extends a groove separating the linguo-lingual ridge from the lingual marginal ridge, which groove may extend upwards on the proximate side of the tooth.

Mesial and Distal Surfaces.

The mesial and distal surfaces of the upper lateral incisors (Figs. 15 and 16) present the characteristic triangular outlines of the incisors, and

are bounded by the three line angles, gingival, labial, and lingual. The labial line angle of both the mesial and distal surfaces is convex incisogingivally, with the greatest amount of convexity near the gingival marginal ridge. The lingual line angle of the mesial and distal surfaces is convex

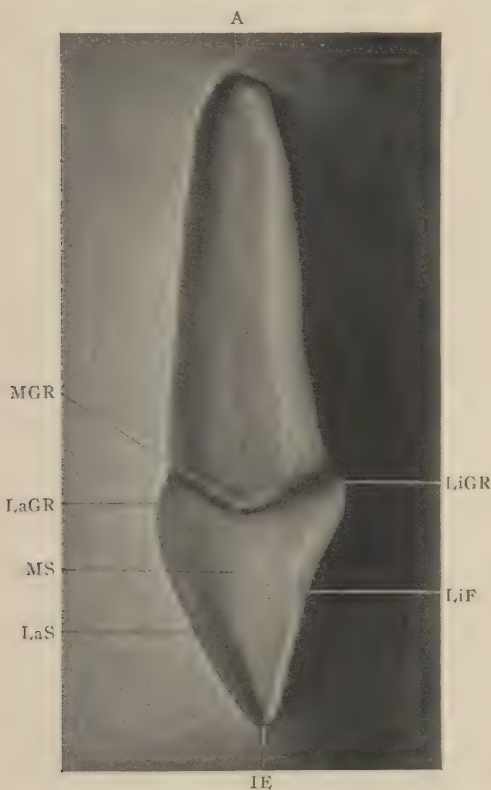


Fig. 15.—Mesial surface of the upper right lateral incisor. MGR, Mesio-gingival ridge; LaGR, Labio-gingival ridge; MS, Mesial surface; LaS, Labial surface; IE, Incisal edge; LiF, Lingual fossa; LiGR, Linguo-gingival ridge; A, Apex of root.

in the region of the linguo-gingival ridge, then becomes concave near the lingual fossa, and in the incisal third is very often straight. Bucco-lingually, the mesial and distal surfaces are convex, although there may be a concavity on one or both sides near the gingival third. The most prominent portion of the mesial and distal sur-

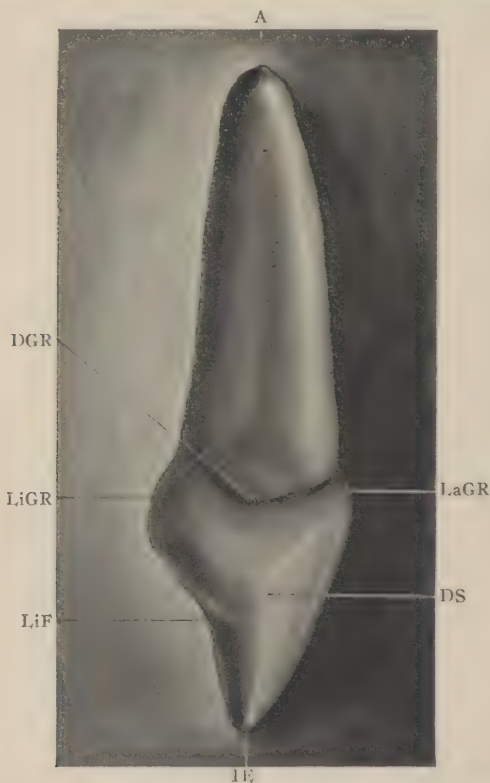


Fig. 16. -Distal surface of the upper lateral incisor. DGR, Disto-gingival ridge; LiGR, Linguo-gingival ridge; LiF, Lingual fossa; IE, Incisal edge; DS, Distal surface; LaGR, Labio-gingival ridge; A, Apex of root.

faces is the convexity, which is formed near the incisal third, and known as the proximate contact point.

Incisal Edge.

In looking directly at the incisal border of a lateral incisor, it will be noted that the incisal edge of the tooth is slightly nearer the labial than the lingual. The well developed marginal ridges,

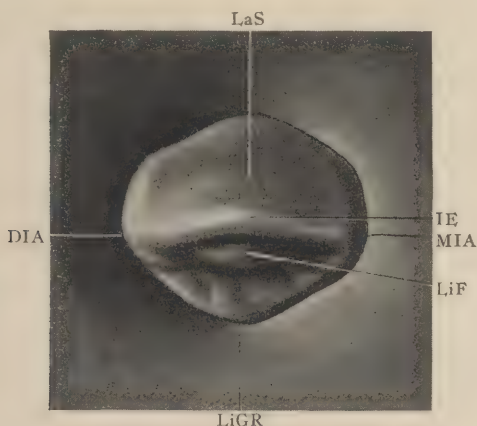


Fig. 17.—Incisal view of upper lateral incisor. DIA, Disto-incisal angle; LiGR, Linguo-gingival ridge; LiF, Lingual fossa; MIA, Mesio-incisal angle; IE, Incisal edge; LaS, Labial surface.

and also the lingual fossa, can be seen (Fig 17). The labial surface is convex mesio-distally and occluso-lingivally.

Pulp Cavity.

The pulp canal of the upper lateral incisor (Fig. 18) follows the same general outline as the

root of the tooth, being widest in the portion of the gingival marginal ridge. The author again wishes to call the reader's attention to the fact that the pulp canals of the lateral incisors in young individuals are much larger than they are

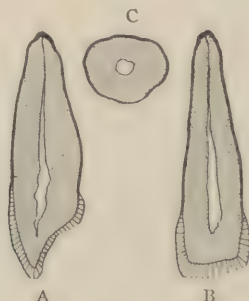


Fig. 18.—Pulp cavity of the upper lateral incisor. A, Bucco-lingual diameter; B, Mesio-distal diameter; C, Cross section of pulp cavity.

in older persons. The root of the upper lateral incisors has a tendency to turn, which consequently will cause the pulp canal to follow the same general plan.

Occlusion.

The upper lateral incisor occludes with the disto-labial half of the lower lateral and with the mesio-labial inclined plane of the lower canine.

Practical Consideration.

Such points of practical importance as have been mentioned in regard to the upper central incisor also hold true in regard to the upper laterals. Owing to the large amount of convexity on the distal surface of the upper lateral in-

cisor, restorations with fillings and inlays require considerable care in order that they may have the proper shape so that they may restore the proximate contact and preserve the interproximate gum tissue. The root of the upper lateral incisor is of the same form and shape as it is in the central, with the exception that, as compared to the length of the crown, the root of the lateral is shorter than it is in the central. Consequently greater care must be taken in making a crown for the lateral incisor, in which a post is used, owing to the small size of the root and the comparative shortness of the crown.

LOWER LATERAL INCISOR.

The lower lateral incisor presents the same outline as the lower central incisor with the exception that it is larger in all dimensions.

Labial Surface.

The labial surface of the lower lateral incisor (Fig. 19) is convex in all directions with the greatest amount of convexity near the gingival third. The labial surface is marked by two developmental grooves and three ridges, and is wider mesio-distally than the lower central incisor. It presents four line angles, incisal, mesial, gingival, and distal, and four point angles, mesio-incisal, mesio-gingival, disto-incisal and disto-gingival.

Lingual Surface.

The lingual surface (Fig. 20) is bounded by the same point angles and same line angles as the labial surface, and, as a rule, presents three marginal ridges, the mesial, gingival, and distal, which

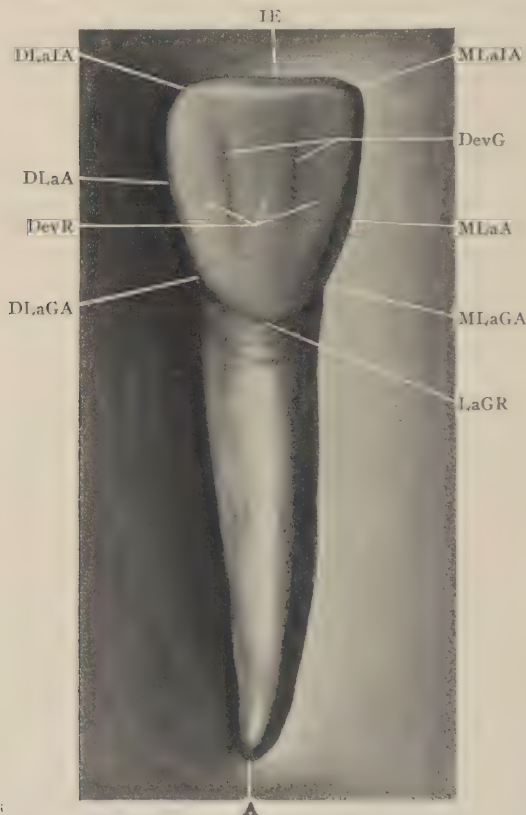


Fig. 19.—Labial surface of the lower lateral incisor. DLaIA, Disto-labio-incisal angle; DLaA, Disto-labial angle; DevR, Developmental ridges; DLaGA, Disto-labio-gingival angle; A, Apex of root; LaGR, Labio-gingival ridge; MLaGA, Mesio-labio-gingival angle; MLaA, Mesio-labial angle; DevG, Developmental grooves; MLaIA, Mesio-labio-incisal angle; IE, Incisal edge.

extend from the mesio-incisal angle gingivally, crossing the gingival border of the tooth and forming the gingival marginal ridge, then continuing incisally to the disto-incisal angle, forming the characteristic U-shaped ridge found on

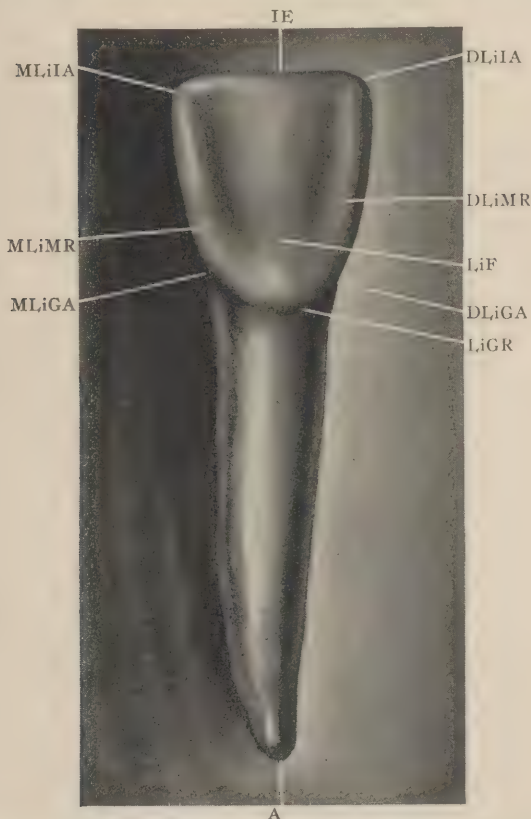


Fig. 20.—Lingual surface of the right lower lateral incisor. MLiIA, Mesio-linguo-incisal angle; MLiMR, Mesio-lingual marginal ridge; MLiGA, Mesio-linguo-gingival angle; A, Apex of root; LiGR, Linguo-gingival ridge; DLiGA, Disto-linguo-gingival angle; LiF, Lingual fossa; DLiMR, Disto-linguo-marginal ridge; DLiIA, Disto-linguo-incisal angle; IE, Incisal edge.

all of the incisors. Ocluso-gingivally, the central portion of the lingual surface is almost flat, then the gingival third becomes decidedly convex in the region of the gingival marginal ridge. Mesio-distally, the lingual surface is at first decidedly convex in the region of the mesial or distal

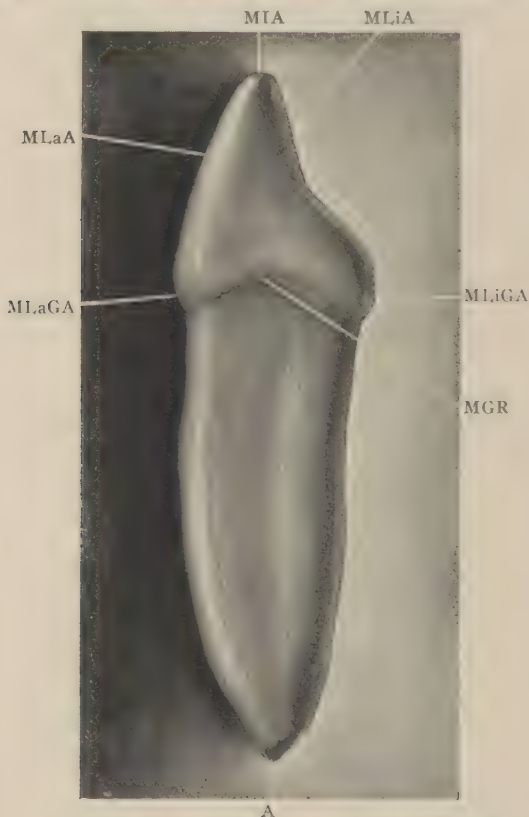


Fig. 21.—Mesial surface of the lower right lateral incisor. MLaA, Mesio-labial line angle; MLaGA, Mesio-labio-gingival angle; A, Apex of root; MGR, Mesio-gingival ridge; MLiGA, Mesio-linguo-gingival angle; MLiA, Mesio-lingual line angle; MIA, Mesio-incisal angle.

marginal ridge, then concave in the central portion of the tooth.

Mesial and Distal Surfaces.

The mesial and distal surfaces of the tooth (Figs. 21 and 22) present the characteristic lines

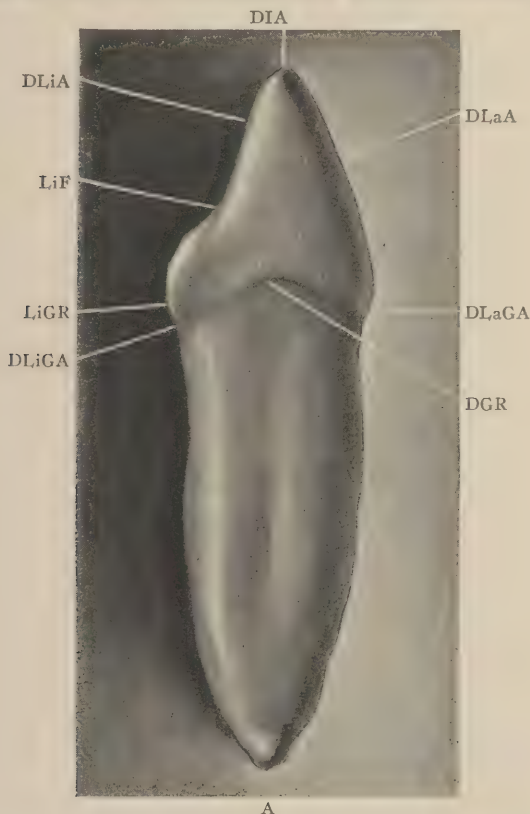


Fig. 22.—Distal surface of the lower lateral incisor. DLiA, Disto-lingual angle; LiF, Lingual fossa; LiGR, Linguo-gingival ridge; DLiGA, Disto-linguo-gingival angle; A, Apex of root; DGR, Disto-gingival ridge; DLaGA, Disto-labio-gingival angle; DLaA, Disto-labial line angle; DIA, Disto-incisal angle.

and angles of the mesial and distal surfaces of all the incisors. The labial line angle is almost straight until it approaches the gingival portion of the tooth, where it becomes decidedly convex. The gingival margin of both the mesial and distal surfaces is convex, with the convexity towards the crown. The lingual line angles of these two surfaces are at first straight in the incisal two-

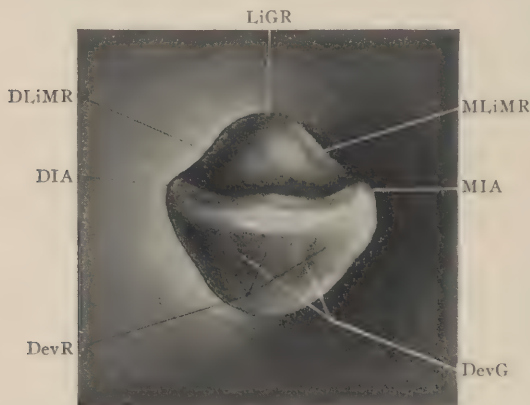


Fig. 23.—Incisal view of the lower lateral incisor. DLiMR, Disto-lingual marginal ridge; DIA, Disto-incisal angle; DevR, Developmental ridges; DevG, Developmental grooves; MIA, Mesio-incisal angle; MLiMR, Mesio-lingual marginal ridge; LiGR, Linguo-gingival ridge.

thirds, then decidedly convex in the gingival portion. The mesial surface of the lateral incisors is convex in all directions, with the greatest amount of convexity near the incisal third, which forms the proximate contact point of the tooth. Near the gingival portion this surface may be flat or slightly concave.

Incisal Edge.

In viewing the incisal edge of the lower lateral incisor, it is seen that the crown is so shaped that the incisal edge lies lingual to the labio-lingual center of the tooth. This brings the cutting edge of the tooth near the center of the root, which enables the tooth to receive the greatest amount of stress in its long axis.

Pulp Cavity.

The root of the lower lateral incisor (Figs. 19, 20, 21, and 22) is wider labio-lingually than it is mesio-distally. The mesio-distal side of the root may be flattened, or even present a groove, as shown in Fig. 22. The end of the root may be

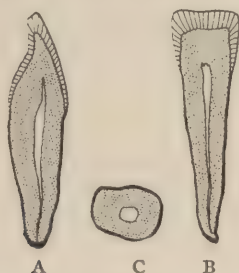


Fig. 24.—Pulp cavity of the lower lateral incisor. A, Labio-lingual diameter; B, Mesio-distal diameter; C, Cross section of pulp cavity.

slightly turned in either direction, or it may be perfectly straight and triangular. The pulp cavity of the lateral incisor follows the same outline as the root, with the greatest width of the pulp cavity in the region of the gingival marginal ridge.

Occlusion.

The lower lateral incisor occludes with the upper central incisor, and the mesial half of the lingual surface of the upper lateral incisor.

Practical Consideration.

The same practical points that have been mentioned in reference to the lower central incisor apply equally as well to the lower lateral incisor, with the exception that the pulp canal is larger in the lateral than in the central, and, therefore, is not so difficult to treat, neither is there as great a liability of drilling through the side of the tooth in opening into the pulp canal.

CHAPTER III.

CANINES, OR CUSPIDS.

The canines, or cuspids, are the third teeth from the median line, and are situated between the lateral incisors and the first premolars, or bicuspids. They are sometimes called "eye teeth" because of the length of the root and the proximity of the tooth germ to the orbital cavity during the process of development. They are called cuspids, because of the shape of the incisal edge, which is divided in the mesio-incisal and disto-incisal portion, terminating as a cusp near the center of the middle developmental lobe. They are called canines because of the position and the relation which they bear in the study of comparative dental anatomy, for they are well developed in some animals, especially the canidæ for the purpose of prehension and warfare. They are the second group of teeth from the median line, the incisors being first, but they are first in function, since they are used for prehension. They are the first teeth in the upper arch to be located in the superior maxillary bone; the corresponding teeth below in the mandible are called the lower canines.

UPPER CANINE, OR CUSPID.

The upper canine presents the same surfaces as the incisor—labial, lingual, mesial, and distal.

The first anatomical variation between the canine and the incisor to be considered is the fact that the canine possesses a well developed central lobe larger than the mesial and distal lobe, which condition is just the reverse from that found in the incisor. As the result of the excessive development of the central lobe of the canine, the cutting edge is developed to a point. It is the development of this point which has caused the tooth to be named "cuspid," and distinguishes it from the incisors. The root of the canine is longer and stronger than the root of the central incisor. The labial surface of the upper canine has about the same occluso-gingival diameter as the central incisor. The mesio-distal diameter of the canine is about the same as the central, although it may be narrower in some instances.

Labial Surface.

The labial surface of the upper canine is decidedly convex in all directions, being much more convex mesio-distally than the labial surface of the central incisor on account of the development of the central lobe. It is also more convex, occluso-gingivally. The labial surface is bounded by five line angles and five point angles. The line angles are the gingival, mesial, mesio-incisal, disto-incisal, and distal. The point angles are the mesio-gingival, mesio-incisal, incisal,* disto-incisal, and disto-gingival. The gingival border of the labial surface has a decided convexity towards the root, and is more convex than the central in-

*The incisal angle is the cusp.

cisor. The gingival line angle of the labial surface, also known as the labio-gingival ridge, is more highly developed than in the incisor. In

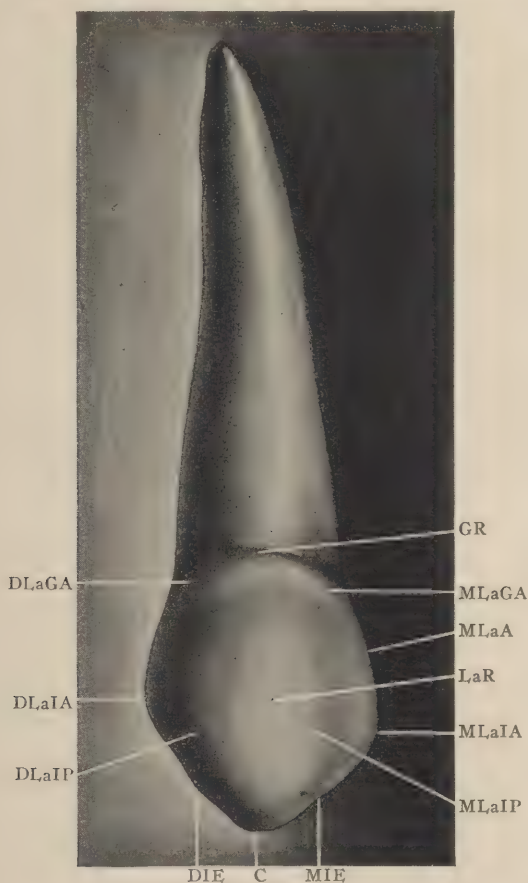


Fig. 25.—Labial surface of the upper right canine. DLaGA, Disto-labio-gingival angle; DLaIA, Disto-labio-incisal angle; DLaIP, Disto-labial inclined plane; DIE, Disto-incisal edge; C, Cusp; MIE, Mesio-incisal edge; MLaIP, Mesio-labial inclined plane; MLaIA, Mesio-labio-incisal angle; LaR, Labial ridge; MLaA, Mesio-labial angle; MLaGA, Mesio-labio-gingival angle; GR, Gingival ridge.

the upper canines the mesial and distal line angles of the labial surface are shorter than they are in the central incisors, and consequently they converge towards the center of the crown much more rapidly than they do in the incisors. The mesial margin of the labial surface is in most instances slightly longer than the distal margin. Of the incisal edges, the mesio-incisal edge is shorter than the disto-incisal edge. The mesio-incisal and disto-incisal edges of the canine join each other at the incisal angle at an angle of almost 90 degrees, which forms a right angle in newly erupted teeth. The gingival portion of the labial surface is about one-third narrower than the greatest width of the labial surface through the mesio-incisal and disto-incisal angles. The gingival border of the labial surface is almost a quarter of an arc of a circle. The great convexity of the labial surface of the canine is caused by the development of the central lobe, which forms a ridge known as the labial ridge of the upper canine, extending from the gingival border to the incisal angle. This labial ridge divides the labial surface of the canine into two slopes, known as the mesio-labial and disto-labial inclined planes. Two developmental grooves are also found on the labial surface, which separate the three developmental lobes, and on the canine the developmental grooves are nearer the mesial and distal angle of the tooth than they are on the centrals. These developmental grooves may cross the mesio-incisal and disto-

incisal edges of a newly erupted tooth so as to very distinctly separate the mesial and distal lobes from the central lobe, forming three tubercles, or mamelons, similar to those found on the cutting edge of the incisors. Owing to the great development of the central lobe, these mamelons are not as easily distinguished as they are in the incisors.

Lingual Surface.

The lingual surface of the upper canine (Fig. 26) presents the same line angles and point angles as the labial surface. The lingual surface of the upper canine is much narrower at the gingival portion than the labial surface, due to the fact that the mesial and distal surfaces of the crown converge towards the center of the tooth at the lingual side. As a result, the linguo-gingival ridge of the lingual surface is a smaller arc of a circle than the linguo-gingival ridge of the labial surface. The incisal two-thirds of the lingual surface is generally flat, although it may be slightly concave. The lingual surface becomes decidedly convex both occluso-lingivally and mesio-distally at the linguo-gingival ridge. There is a lingual ridge extending incisally from the linguo-gingival margin which has a tendency to divide the lingual surface into two inclined planes, known as the mesio-lingual and the disto-lingual inclined planes. There may be a convexity on the mesial and distal sides of this lingual ridge, which is made more noticeable by the development of the

mesio-lingual and disto-lingual marginal ridges. These marginal ridges extend from the mesio-incisal and disto-incisal angles gingivally, and unite with the linguo-gingival ridge. These three de-

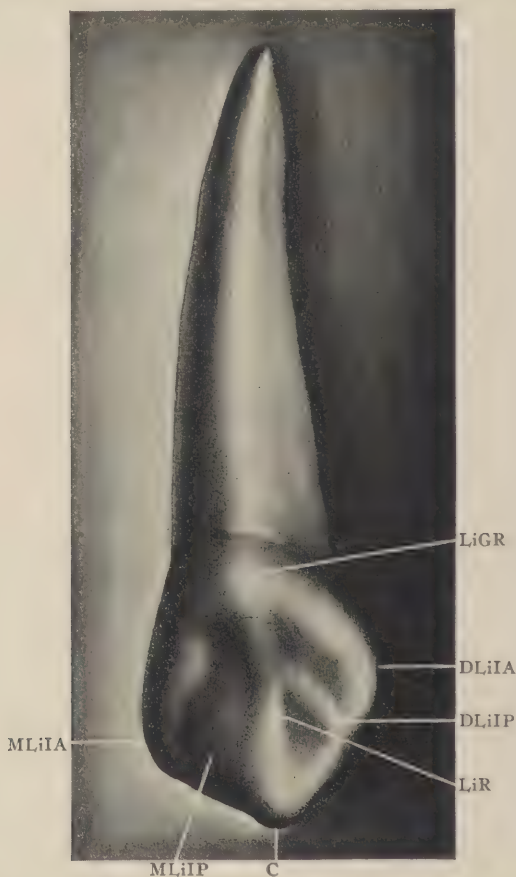


Fig. 26.—Lingual surface of the upper right canine. MLiIA, Mesio-linguo-incisal angle; MLiIP, Mesio-linguo-inclined plane; C, Cusp; LiR, Lingual ridge; DLiIP, Disto-lingual inclined plane; DLiIA, Disto-linguo-incisal angle; LiGR, Linguo-gingival ridge.

velopmental ridges on the upper canines, as a rule, are not as well developed as they are on the incisors, although they can be very easily outlined.

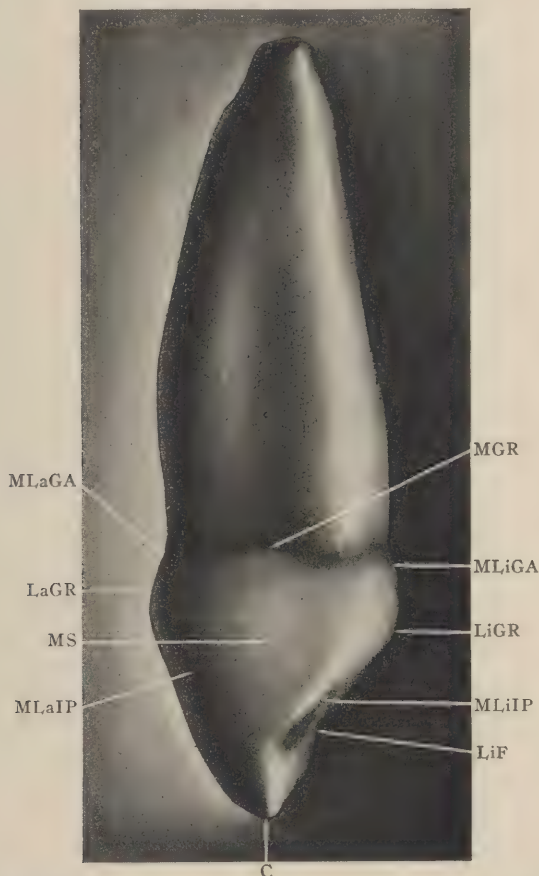


Fig. 27.—Mesial surface of the upper right canine. MLaGA, Mesio-labio-gingival angle; LaGR, Labio-gingival ridge; MS, Mesial surface; MLaiP, Mesio-labial inclined plane; C, Cusp; LiF, Lingual fossa; MLiIP, Mesio-lingual inclined plane; LiGR, Linguo-gingival ridge; MLiGA, Mesio-linguo-gingival angle; MGR, Mesio-gingival ridge.

The mesio- and disto-gingival marginal ridges of the lingual surface of the upper canines are shorter than they are on the incisors. In some cases, the central gingival portion of the linguo-gingival ridge develops into a cusp or cingulum. Rarely, or occasionally, the cingulum is divided into two parts, forming a double cingulum.

Mesial Surface.

The mesial surface of the upper canine is marked by the same line angles and point angles as the mesial surface of the central incisor, but, incisio-gingivally, the mesial surface is shorter, owing to the fact that in the canine the mesio-incisal angle is nearer the gingival margin than in the incisor. The mesial surface is convex, with the greatest amount of convexity near the mesio-incisal angle. The labial portion of the mesial surface is convex, with the convexity to the labial. The lingual portion of the mesial surface is generally straight, or slightly concave, with the concavity to the lingual in the incisal two-thirds, and then it becomes decidedly convex in the region of the linguo-gingival ridge. The greatest amount of convexity of the mesial portion of the labial surface is near the gingival marginal ridge.

Distal Surface.

The distal surface is bounded by the same line angles and point angles as the distal surface of the central incisors. The distal surface of the upper canine is much more convex labio-lingually

and inciso-lingually than the mesial surface. The greatest width of the crown of the tooth over the width of the root is produced by the greater

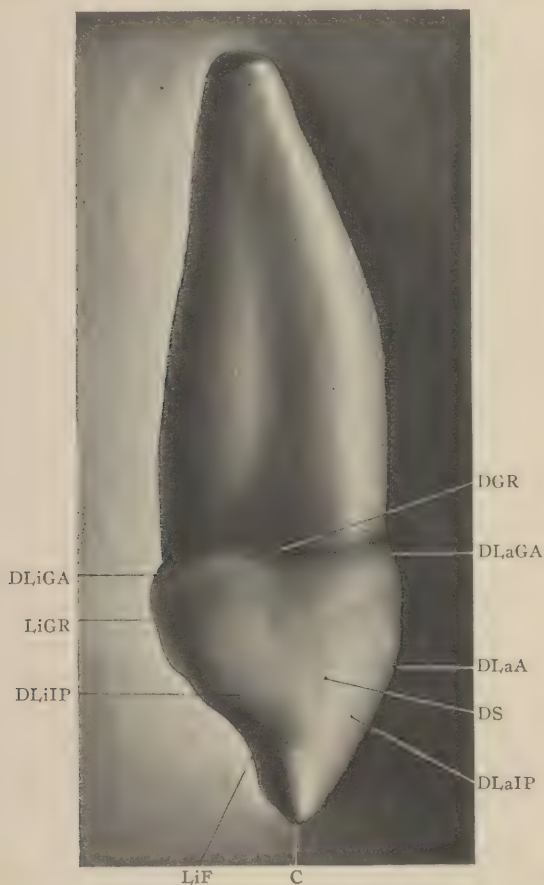


Fig. 28. —Distal surface of the upper right canine. DLiGA, Disto-linguo-gingival angle; LiGR, Linguo-gingival ridge; DLiIP, Disto-lingual inclined plane; LiF, Lingual fossa; C, Cusp; DLaiP, Disto-labial inclined plane; DS, Distal surface; DLaA, Disto-labial line angle; DLaGA, Disto-labio-gingival angle; DGR, Disto-gingival ridge.

convexity of the distal surface as compared to the mesial surface. According to Black, the labio-lingual curvature of the gingival line is about two and five-tenths millimeters, averaging from one millimeter to three and five-tenths millimeters on the mesial surface and a very little less on the distal surface.

Incisal Edge.

An incisal view of the upper canine shows that the cusp is nearer the mesial than the distal and the disto-incisal edge is longer than the mesio-

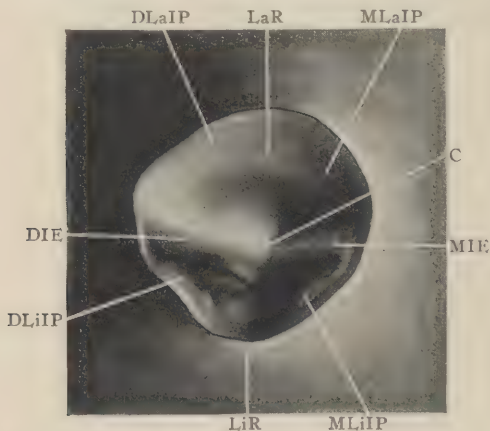


Fig. 29.—Incisal view of the upper right canine. DIE, Disto-incisal edge; DLiP, Disto-lingual inclined plane; LiR, Lingual ridge; MLiP, Mesio-lingual inclined plane; MIE, Mesio-incisal edge; C, Cusp; MLaIP, Mesio-labial inclined plane; LaR, Labial ridge; DLaIP, Disto-labial inclined plane.

incisal edge. The labial surface forms almost an arc of a circle and approaches the mesial and distal angles with an equal amount of convexity. The lingual ridge and the linguo-gingival ridge

join each other so as to form a convex surface which slopes towards the mesio-incisal and disto-incisal angles.

The Root.

The root of the upper canine is the longest found in the human mouth, averaging eighteen millimeters. Ten and five-tenths millimeters is the shortest we have observed, and twenty-two and five-tenths millimeters the longest. The root of the upper canine is conical in shape. The labio-lingual diameter of the root is greater than the mesio-distal diameter, which has the effect of giving the root a flattened appearance when viewed from the mesial or distal side. The mesial and distal sides of the upper canine may be grooved as in Figs. 27 and 28. The root tapers very gradually from the linguo-gingival ridge to the apex until it approaches the apical third. In some instances, it narrows quite abruptly, especially on the labial and lingual sides. Frequently the root of the upper canine may be curved either mesially or distally, and this curvature is probably produced by interference during the time of the formation of the root.

Pulp Cavity.

 The pulp cavity of the canine, as a rule, is a straight canal, following the outline of the root, and is much larger than it is in any of the other single rooted teeth. The apex of the root of the upper canine has a tendency to be curved, which

sometimes causes much difficulty in filling the root entirely to the end. Owing to the large size of the pulp cavity, there is very little danger of drilling through the sides of the canine root except in the apical third.

Occlusion.

The mesio-labial and disto-labial inclined planes of the upper canine have no occlusion. The mesio-lingual inclined plane of the upper canine occludes

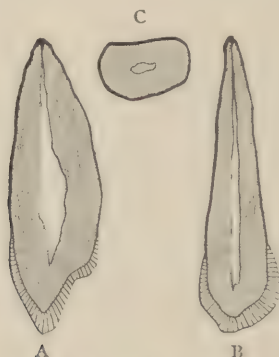


Fig. 30.—Pulp cavity of the upper canine. A, Labio-lingual diameter; B, Mesio-distal diameter; C, Cross section of pulp cavity.

with the disto-labial inclined plane of the lower canine. The disto-lingual inclined plane of the upper canine occludes with the mesio-buccal inclined plane of the buccal cusp of the lower first premolar.

Practical Consideration.

The canine, owing to its length, does more towards forming the corner of the mouth and giv-

ing the proper facial expression than any other tooth. The extraction of the upper canine will allow the angle of the lip and corner of the nose to sink and produce an expression that is found in people of old age who have lost their teeth. The excessive length and strength of its root makes the canine a very favorable tooth to use for the attachment of bridges or removable dentures. Owing to the shape of the incisal edges and the peculiar contour of the mesio- and disto-incisal angles, great care must be observed in restoring the mesial and distal sides of the tooth in order to give the restoration the proper contour. It must also be remembered, in making crowns or bridges, that the mesio-incisal angle is shorter than the disto-incisal angle, that there is a greater convexity on the distal surface than on the mesial surface, and that it is necessary for these points to be reproduced in order that the tooth may have a natural appearance. In old persons the cusp of the canine becomes greatly worn and shortened, and, in making restorations, they must be made to harmonize with the age of the patient. Due to the position which the upper canine occupies in the dental arch, there is a great tendency for the gum on the labial surface of the upper canine to recede, which may be produced by brushing the teeth improperly.

LOWER CANINE, OR CUSPID.

The lower canine is the third tooth from the median line in the lower arch, and is located dis-

tally to the lower lateral incisors, and mesially to the lower first premolar. In general shape and outline it resembles the upper canine, although the crown is slightly narrower mesio-distally, and therefore appears a little longer. In fact, in a number of cases, it will be found that the crown of the lower canine is slightly longer than the upper canine.

Labial Surface.

The labial surface of the lower canine presents the same line angles and point angles as the upper canine. The mesial line angle of the labial surface is longer than the distal line angle of the same surface, and is more of a straight line. The distal portion of the labial surface is decidedly convex, with the convexity towards the premolar. The disto-incisal edge of the labial surface is about twice as long as the mesio-incisal edge, therefore the tip of the cusp of the lower canine is situated between the mesial and the middle third. In some of the lower canines the mesio-incisal edge of the labial surface from the tip of the cusp to the mesio-incisal angle will be very nearly a straight line, or will be a line nearly at right angles with the mesio-distal diameter of the tooth. In some teeth, as shown in Fig. 31, it will be seen that the mesio-incisal angle does slope gingivally from the tip of the cusp to the mesio-incisal angle. The disto-incisal edge always slopes gingivally at a much greater degree than does the mesio-incisal edge, and is about twice as long. It will also

be observed that, in the majority of lower canines, the line from the mesio-incisal angle of the labial surface to the apex of the root is very nearly a straight line with only a slight con-

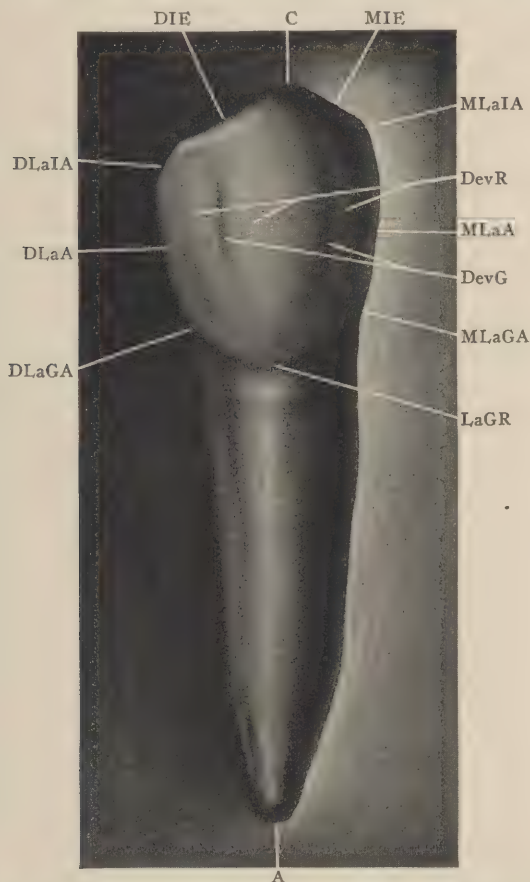


Fig. 31.—Labial surface of the lower right canine. DLaiA, Disto-labio-incisal angle; DLaA, Disto-labial line angle; DLaGA, Disto-labio-gingival angle; A, Apex of root; LaGR, Labio-gingival ridge; MLaGA, Mesio-labio-gingival angle; DevG, Developmental groove; MLaA, Mesio-labial line angle; DevR, Developmental ridges; MLaIA, Mesio-labio-incisal angle; MIE, Mesio-incisal edge; C, Cusp; DIE, Disto-incisal edge.

striction at the gingival portion of the crown or the neck of the tooth. Therefore, the greater width of the crown of the lower canine as compared to the width of the root is produced by the convexity of the distal portion of the crown being greater than the convexity of the mesial portion.

Lingual Surface.

The lingual surface of the lower canine possesses the same point angles, line angles, and the same ridges as the lingual surface of the upper canine, and differs only in the fact that the ridges are not as well developed and the lingual surface is more nearly smooth. The same relative length of the different line angles, as mentioned in the description of the labial surface, can also be seen on the lingual surface (Fig. 32). The mesio-lingual marginal ridge is about one-third longer than the disto-lingual marginal ridge, and usually joins the gingival marginal ridge at more of a right angle than it does on the upper canine. The gingival marginal ridge of the lower canine as a rule is longer, and occupies a greater portion of the lingual surface than does the gingival marginal ridge of the upper canine. The gingival marginal ridge of the upper canine has a tendency to develop into a tubercle, while, on the other hand, the development of a tubercle on the lower canine is very rare. There may be a lingual convexity on the lingual side of the lower canine, but because of the absence of the tubercle a lingual convexity of the lower canine is not as

well developed as it is on the upper canine. The lingual surface of the lower canine is wider in comparison than the lingual surface of the upper canine.

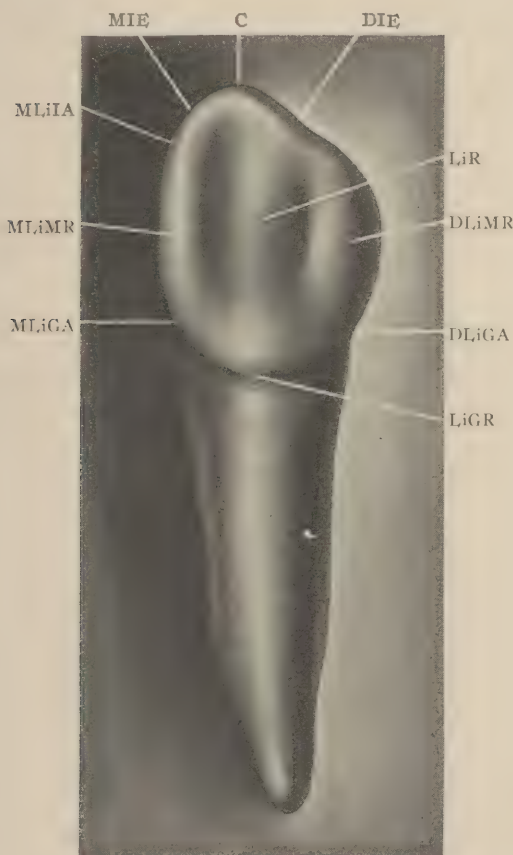


Fig. 32.—Lingual surface of the lower right canine. MLiIA, Mesio-linguo-incisal angle; MLiMR, Mesio-lingual marginal ridge; MLiGA, Mesio-linguo-gingival angle; LiGR, Linguo-gingival ridge; DLiGA, Disto-linguo-gingival angle; DLiMR, Disto-linguo-marginal ridge; LiR, Lingual ridge; DIE, Disto-incisal edge; C, Cusp; MIE, Mesio-incisal edge.

Mesial Surface.

The mesial surface of the crown of the lower canine is bounded by three point angles, the incisal, labio-gingival, and linguo-gingival, and three line angles, the labial, lingual, and gingival,

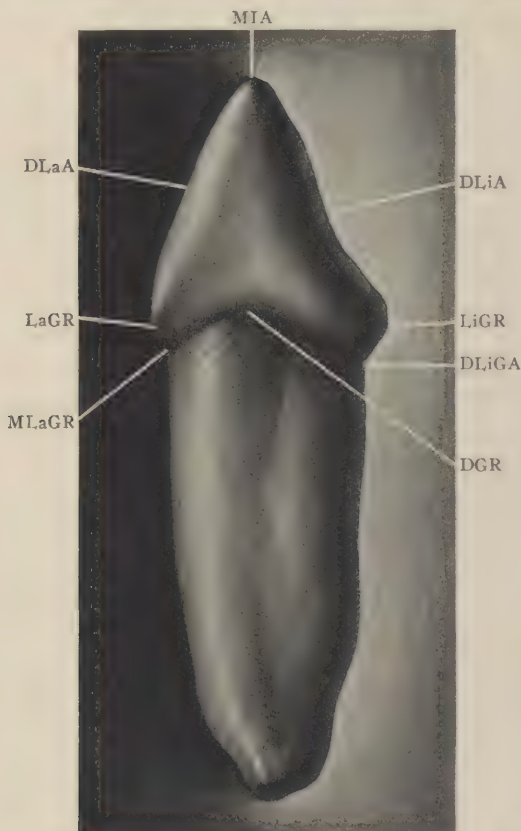


Fig. 33.—Mesial surface of the lower right canine. DLaA, Disto-labial line angle; LaGR, Labio-gingival ridge; MLaGR, Mesio-labio-gingival ridge; DGR, Disto-gingival ridge; DLiGA, Disto-linguo-gingival angle; LiGR, Linguo-gingival ridge; DLiA, Disto-lingual line angle; MIA, Mesio-incisal angle.

the names being similar to those in the upper canine. The mesial surface is less convex than any of the surfaces of the upper or lower canines, and is nearly straight the entire length of the

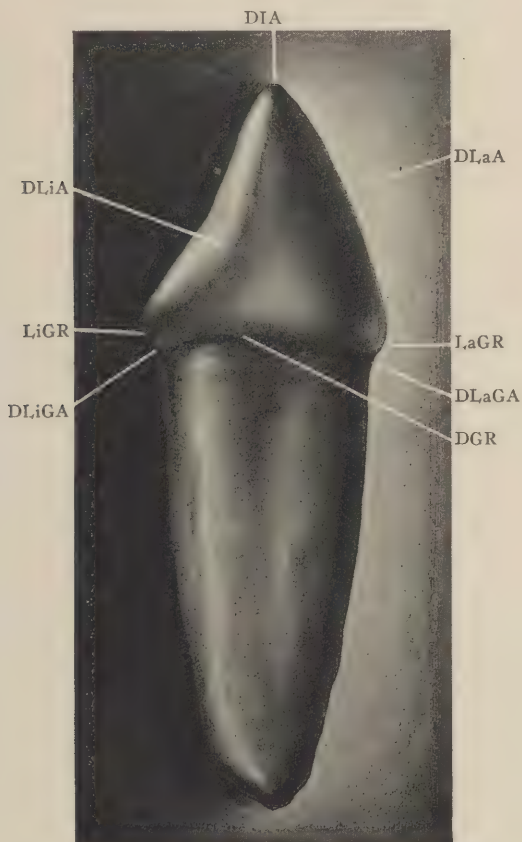


Fig. 34.—Distal surface of the lower right canine. DLiA, Disto-lingual line angle; LiGR, Linguo-gingival ridge; DLiGA, Disto-linguo-gingival angle; DGR, Disto-gingival ridge; DLaGA, Disto-labio-gingival angle; LaGR, Labio-gingival ridge; DLaA, Disto-labial line angle; DIA, Disto-incisal angle.

crown from the incisal to the gingival border, and forms almost a straight line with the root.

Distal Surface.

The distal surface of the lower canine is bounded by the same line angles and point angles as the distal surface of the upper canine, and is the most convex surface of either the upper or lower canine. The distal surface of a newly erupted lower canine from the disto-incisal angle to the gingival marginal ridge is decidedly convex, and is only about two-thirds as long as the same diameter on the mesial surface. The extreme amount of convexity on the distal surface of the lower canine gives the lower canine the appearance of being bent towards the distal at the neck of the tooth. There may be a slight concavity on the distal surface near the gingival marginal ridge. The gingival marginal ridge of the distal surface is as well developed as it is on all of the other surfaces of the lower canine (Fig. 34).

Incisal Edge.

The occlusal view of the lower canine (Fig. 35) shows the tip of the cusp at about the junction of the mesial and the middle third of the tooth. The tip of the cusp in newly erupted canines should occlude between the upper lateral incisor and the lower canine. The ridge, which is caused by the development of the central developmental lobe, divides the labial surface of the lower canine into two inclined planes, known as the mesio-

labial and the disto-labial inclined planes. A lingual ridge can also be seen extending from the tip of the cusp to the linguo-gingival marginal ridge.

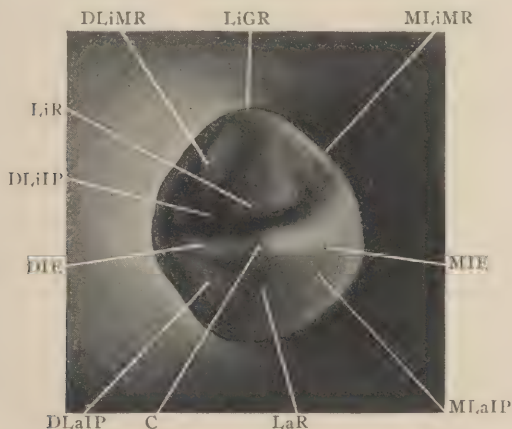


Fig. 35.—Incisal view of the right lower canine. LiR, Lingual ridge; DLiIP, Disto-labial inclined plane; DLiE, Disto-incisal edge; DLaiP, Disto-labial inclined plane; C, Cusp; LaR, Labial ridge; MLaiP, Meso-labial inclined plane; MIE, Meso-incisal edge; MLiMR, Meso-lingual marginal ridge; LiGR, Linguo-gingival ridge; DLiMR, Disto-lingual marginal ridge.

The Root.

The root of the lower canine is conical in shape, the labio-lingual diameter being greater than the mesio-distal. The mesial and distal surfaces are almost flat or may be slightly grooved. The labial surface of the root is nearly an arc of a circle and joins the mesial and distal surfaces so as to form well marked angles. The mesial and distal surfaces converge toward the lingual and join the lingual surface without any well defined angles. The lingual surface is an arc of a smaller circle than the labial surface.

Pulp Cavity.

The pulp cavity of the lower canine follows the same general outline as the root of the tooth. The labio-lingual diameter of the pulp cavity is the

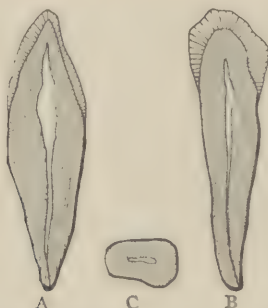


Fig. 30. Pulp cavity of the lower canine. A, Labio lingual diameter; B, Mesio-distal diameter; C, Cross section of pulp cavity.

greater with the greatest width in the region of the gingival ridges. The cavity gradually tapers toward the apex of the root.

Occlusion.

The mesio-labial inclined plane of the lower canine occludes with the disto-lingual portion of the upper lateral incisor. The disto-labial inclined plane occludes with the mesio-lingual inclined plane of the upper canine.

Practical Consideration.

The same practical points outlined in discussing the upper canine apply equally as well to the lower canine. As a rule, the lower canine, for some

reason or other, is less liable to caries than the upper canine, and, according to the author's observations, there is less tendency for the gum to recede from this tooth.

CHAPTER IV.

PREMOLARS, OR BICUSPIDS.

There are eight premolars, or bicuspids, two on each side of the upper jaw, and two on each side of the lower jaw. They are named respectively from the median line, the first and second premolars, or bicuspids. They are named bicuspids because in the upper arch they possess two cusps, a buccal and a lingual. This is not exactly true with the lower premolars, because the tendency of the first is to develop but one cusp, while the lower seconds may have two or three cusps. They are called premolars because they are the teeth which succeed the deciduous molars and are located posterior to the canine and anterior to the permanent molars. The buccal surfaces of the premolars have the same number of lobes, ridges and grooves as the labial surfaces of the incisors and canines, and the buccal surfaces of the upper premolars resemble the labial surfaces of the upper canines. The premolar develops an occlusal surface, which necessarily gives an increased number of grooves and ridges over those of the canine. The lingual cusp may be considered a greater development of the tubercle, which we described in discussing the linguo-gingival ridge of the upper canine, and the central fossa may be considered a diminution of the lingual fossa, caused by the

excessive development of the tubercle on the linguo-gingival ridge so as to form a lingual cusp. The lingual cusps on the upper premolars and on the lower second premolars are well developed, but on the lower first premolar the cusp is very small. The middle lobe of the buccal cusp of the premolars is more highly developed than on the canine, with the result that the mesial and distal lobes are smaller. In the incisors there is a tendency for a groove to originate in the lingual fossa, which crosses the marginal ridges, and in the premolars similar grooves can be followed, extending from the central fossa, which separates the lingual from the buccal cusp.

UPPER FIRST PREMOLAR, OR BICUSPID.

Buccal Surface.

The buccal surface of the upper first premolar has the same number of line angles and point angles as the labial surface of the upper canine. The gingival line angle of the upper premolar is not as convex as it is in the canine. We also find that the cusp of the upper first premolar is nearer the center of the buccal surface, or may be placed nearer the distal, with the result that the mesio-occlusal angle of the buccal surface is slightly longer than the disto-occlusal angle. Likewise, the mesial line angle of the buccal surface is shorter than the distal line angle. This is just the re-

verse of what is found in the canine. Occasionally we find the tip of the cusp of the upper first premolar located more mesially than distally, but this is the exception rather than the rule. The

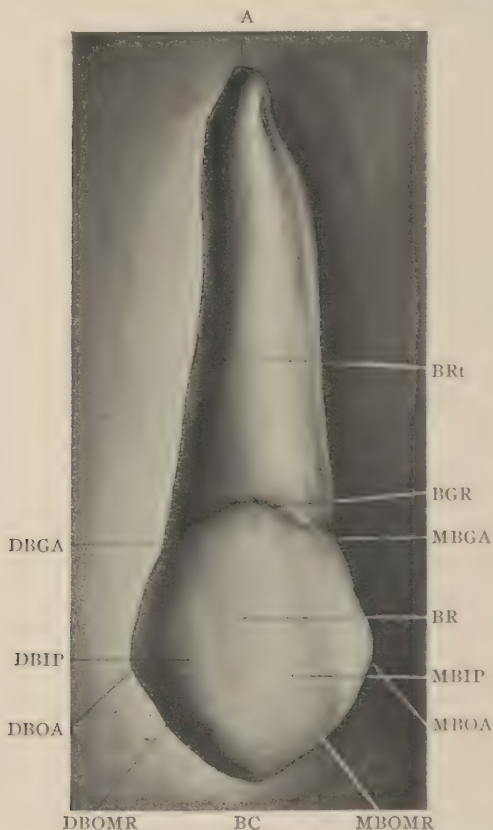


Fig. 37.—Buccal view of the right upper first premolar, or bicuspid. DBGA, Disto-bucco-gingival angle; DBIP, Disto-buccal inclined plane; DBOA, Disto-bucco-occlusal angle; DBOMR, Disto-bucco-occlusal marginal ridge; BC, Buccal cusp; MBOMR, Mesio-bucco-occlusal marginal ridge; MBOA, Mesio-bucco-occlusal angle; MBIP, Mesio-buccal inclined plane; BR, Buccal ridge; MBGA, Mesio-bucco-gingival angle; BGR, Bucco-gingival ridge; BRt, Buccal root; A, Apex of root.

buccal surface is convex ocluso-lingivally, and is equally convex mesio-distally in the gingival third. As we approach the occlusal portion of the buccal surface, we find the central developmental lobe developed into a ridge, known as the buccal ridge, and on each side of the buccal ridge, we find two well developed grooves, the developmental grooves, which separate the buccal ridge from the mesial and distal developmental ridges of the buccal surface. Consequently the occlusal third of the buccal surface is marked by three ridges and two grooves which can be very easily distinguished (Figs. 37 and 41). The mesial and distal angles of the buccal surface join the bucco-occlusal and disto-occlusal angles so as to form points, which are known as the proximate contact points. It will be observed that the mesial and distal margins of the tooth converge towards the gingival about equally. The crown is considerably wider at the junction of the mesio-occlusal and disto-occlusal angles than it is at the gingival portion.

Lingual Surface.

The lingual surface of the upper first premolar presents the same point angles and line angles as the buccal surface. The ocluso-lingival and mesio-distal diameters of the lingual surface are shorter than the same diameters of the buccal surface. The greatest difference in these diameters is noted in the ocluso-lingival diameter, in viewing the tooth from the mesial or dis-

tal side. (Figs. 38 and 39.) However, the lingual cusp of the upper premolars, when viewed in a regular shaped dental arch in normal occlusion,

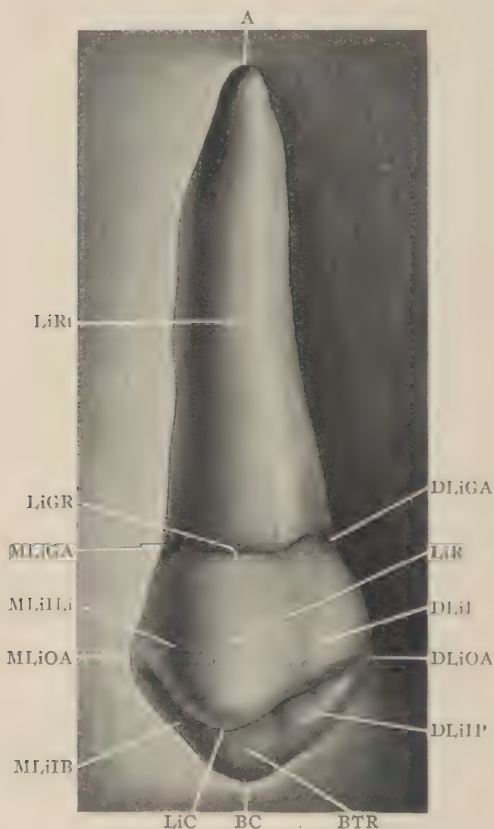


Fig. 38.—Lingual surface of the upper right first premolar. LiRt, Lingual root; LiGR, Linguo-gingival ridge; MLiGA, Mesio-linguo-gingival angle; MLiLi, Mesio-lingual inclined plane of lingual cusp; MLiOA, Mesio-linguo-occlusal angle; MLiIB, Mesio-lingual inclined plane of buccal cusp; LiC, Lingual cusp; BC, Buccal cusp; BTR, Bucco-triangular ridge; DLiIP, Disto-linguo-inclined plane of buccal cusp; DLiOA, Disto-linguo-occlusal angle; DLiLi, Disto-lingual incline of lingual cusp; LiR, Lingual ridge; DLiGA, Disto-linguo-gingival angle; A, Apex of root.

occupies a position lower, or more occlusally, than the buccal cusp. In other words, the upper first premolars are so situated in the dental arch that the lingual cusp is the longer of the two, although from a strictly anatomical standpoint, the dimensions of the occluso-gingival diameters show that the lingual surface is the shorter. The lingual surface is convex in all directions and in a great many cases the occluso-gingival convexity almost forms an arc of a circle; much more so than is shown in the tooth from which Figs. 38 and 39 were made. The lingual surface presents a lingual ridge running occluso-gingivally, which gradually slopes mesio-distally and joins the mesio-occlusal and disto-occlusal angles of the lingual surface. The lingual is more of a round cusp than the buccal.

Mesial and Distal Surfaces.

The mesial surface of the upper first premolar (Fig. 39) is convex occluso-gingivally, with the greatest amount of convexity near the occlusal portion. Bucco-lingually, the mesial surface is flattened, and gradually converges towards the lingual in such a manner that the mesio-buccal angle is more acute than the mesio-lingual angle. The mesial surface joins the buccal surface as a well-marked angle, forming the proximate contact, while it slopes away from the central axis of the tooth towards the lingual, and gradually joins the lingual surface in a round angle. Therefore the lingual portion of the mesial surface is

much nearer the center of the tooth than the buccal portion of the mesial surface. There may be

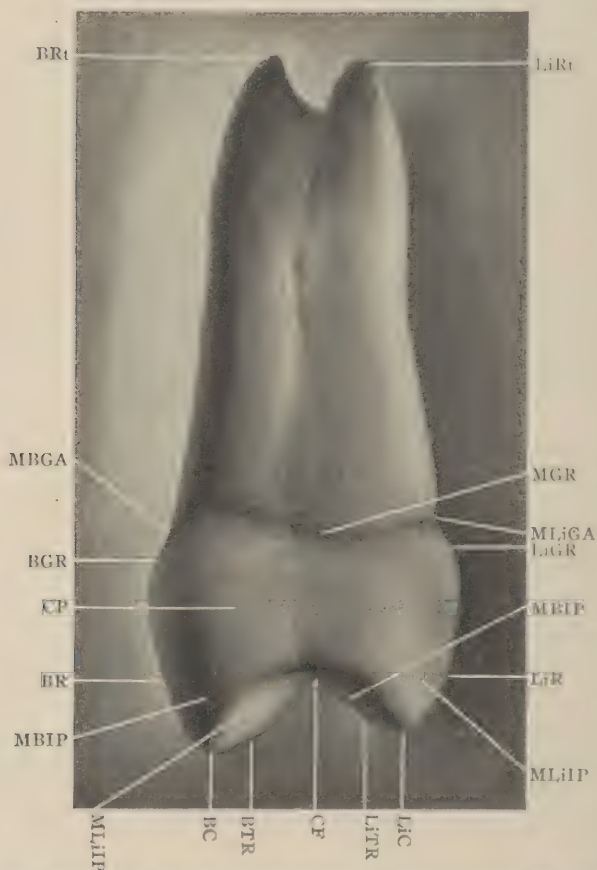


Fig. 39.—Mesial surface of the upper right first premolar. BRt, Buccal root; MBGA, Mesio-bucco-gingival angle; BGR, Bucco-gingival ridge; CP, Contact point; BR, Buccal ridge; MBIP, Mesio-buccal inclined plane; MLiIP, Mesio-lingual inclined plane; BC, Buccal cusp; BTR, Buccal triangular ridge; CF, Central fossa; LiTR, Linguo-triangular ridge; LiC, Lingual cusp; MLiIP, Mesio-lingual inclined plane; LiR, Lingual ridge; MBIP, Mesio-buccal inclined plane; LiGR, Linguo-gingival ridge; MLiGA, Mesio-linguo-gingival angle; MGR, Mesio-gingival ridge; LiRt, Lingual root.

a concavity on the mesial surface near the gingival border, or it may be flat. The mesial surface of

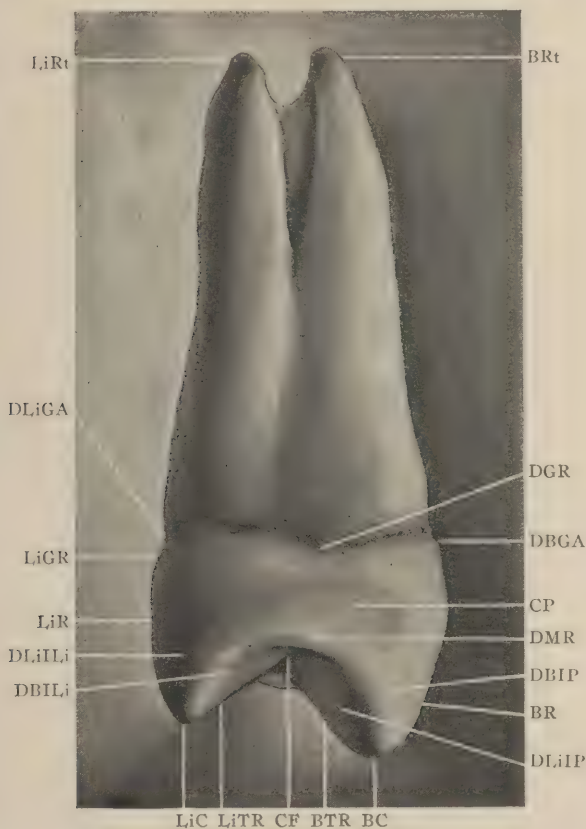


Fig. 40.—Distal surface of the upper right first premolar. LiRt, Lingual root; DLiGA, Disto-linguo-gingival angle; LiGR, Linguo-gingival ridge; LiR, Lingual ridge; DLiLi, Disto-lingual inclined plane of lingual cusp; DBLi, Disto-buccal inclined plane of the lingual cusp; LiC, Lingual cusp; LiTR, Linguo-triangular ridge; CF, Central fossa; BTR, Bucco-triangular ridge; BC, Buccal cusp; DLiP, Disto-lingual inclined plane of buccal cusp; BR, Buccal ridge; DBIP, Disto-buccal inclined plane of buccal cusp; DMR, Distal marginal ridge; CP, Contact point; DBGA, Disto-bucco-gingival angle; DGR, Disto-gingival ridge; BRt, Buccal root.

the upper first premolar proximates the distal portion of the upper canine. The mesial surface of the upper first premolar differs from the mesial surface of any tooth described before, owing to the fact that it has four point angles and four line angles; the line angles being the gingival, lingual, occlusal, and buccal. The gingival line angle, as a rule, is slightly concave, with the concavity towards the root. The occlusal line angle is also concave, with the concavity towards the occlusal surface, made so by the fact that the occlusal margin extends from the tip of the lingual cusp to the tip of the buccal cusp. As a result, the occlusal and gingival line angles approach each other in the region of the center of the tooth. The mesial surface, therefore, is much wider in the buccal and lingual portions than it is in the central portion. The distal surface presents the same general outline as the mesial with the exception that it is generally more convex in all directions and consequently the greater width of the crown of the tooth as compared to the root is more apparent on the distal surface.

Occlusal Surface.

The occlusal surface of the upper first premolar (Fig. 41), when seen in the long axis of the tooth, is a regular quadrilateral, or trapezoidal form, bounded by four line angles and four point angles. The line angles are the buccal, mesial, lingual and distal. The point angles are the mesio-buccal, mesio-lingual, disto-lingual, and

disto-buccal. The mesio-buccal and disto-buccal point angles of the occlusal surface are acute angles very well marked, while the mesio-lingual and disto-lingual are rounded angles. The buccal margin of the occlusal surface is one-fourth to one-third wider than the lingual margin of the occlusal surface, owing to the fact that the mesial

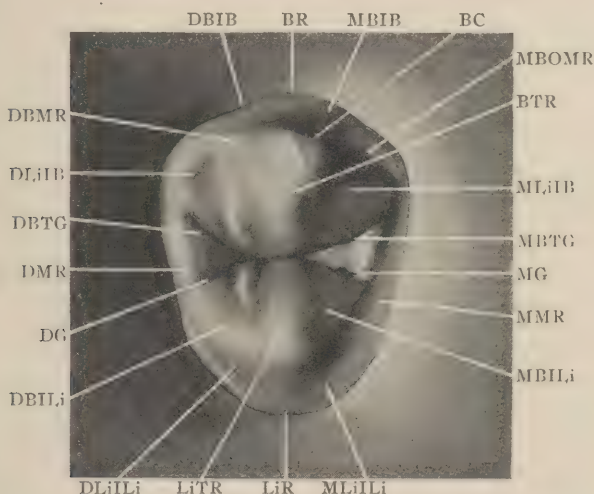


Fig. 41.—Occlusal surface of the upper right first premolar. DBMR, Disto-buccal marginal ridge; DBLiB, Disto-lingual inclined plane of buccal cusp; DBTG, Disto-bucco-triangular groove; DMR, Distal marginal ridge; DG, Distal groove; DBLiLi, Disto-buccal inclined plane of lingual cusp; DLiLiLi, Disto-lingual inclined plane of lingual cusp; LiTR, Linguo-triangular ridge; LiR, Lingual ridge; MLiLiLi, Mesio-lingual inclined plane of lingual cusp; MBLiLi, Mesio-buccal inclined plane of lingual cusp; MMR, Mesial marginal ridge; MG, Mesial groove; MBTG, Mesio-bucco-triangular groove; MLiLiB, Mesio-lingual inclined plane of buccal cusp; BTR, Bucco-triangular ridge; MBOMR, Mesio-bucco-occlusal marginal ridge; BC, Buccal cusp; MBIB, Mesio-buccal inclined plane of buccal cusp; BR, Buccal ridge; DBIB, Disto-buccal inclined plane of buccal cusp.

and distal surfaces of the upper first premolar converge lingually from the mesio-buccal and disto-buccal angle to join the lingual surface.

The junction of the buccal, mesial, lingual, and distal surfaces with the occlusal surface forms four marginal ridges, which are known as the buccal, mesial, lingual, and distal. The buccal and lingual marginal ridges are divided into a mesial marginal and a distal marginal ridge by the summit of the buccal and lingual cusps. Studying the marginal ridges of the tooth, beginning at the tip of the buccal cusp, we find that the mesio-bucco-occlusal marginal ridge slopes gingivally to the mesio-buccal angle of the surface, then turns acutely lingually and becomes the mesial marginal ridge, and passes linguo-gingivally towards the central fossa of the tooth where it is crossed by the mesial groove running from the central fossa. The mesial ridge turns occluso-lingually and becomes the mesio-linguo-occlusal marginal ridge, then passes towards the tip of the lingual cusp, from which point it becomes the disto-linguo-occlusal ridge and can be followed disto-gingivally to the disto-occlusal angle where it becomes the distal marginal ridge, which is crossed by the distal groove, from which point the ridge continues to pass disto-buccally to the disto-buccal angle of the tooth, after which it turns abruptly towards the center of the tooth, passing occlusally again to the tip of the buccal cusp as the disto-bucco-occlusal ridge. It will therefore be seen that the most occlusal points of the marginal ridges are the tips of the buccal and lingual cusps, while the most gingival portion is the region at the mesial and distal grooves. Ow-

ing to the convexity of the buccal and lingual surfaces, the widest portion of the occlusal surface of the tooth is about the occlusal third in the region of the buccal and lingual ridges. The occlusal surface of the upper first premolar is divided mesio-distally by four ridges, which may also begin at the buccal and lingual cusps. Beginning at the buccal cusp, the buccal ridge passes bucco-lingually, dividing the buccal portion of the occlusal surface into two inclines, known as the mesio-buccal and disto-buccal inclined planes. The triangular ridge of the buccal cusp, which passes linguo-lingually from the tip of the buccal cusp and terminates in the central fossa, divides the occlusal surface of the buccal cusp into two inclined planes known as the mesio-lingual and disto-lingual inclined planes of the buccal cusp. Passing linguo-lingually from the tip of the lingual cusp, we find the lingual ridge, which divides the occluso-lingual portion of the occlusal surface into two inclined planes, known as the mesio-lingual and the disto-lingual inclined planes. There is also a triangular ridge passing from the lingual cusp occluso-buccally to the central fossa, which divides the lingual surface into a mesio-buccal and a disto-buccal inclined plane. These two triangular ridges of the buccal and lingual cusps join each other in the region of the central fossa, or are separated by the central fossa in most cases, and, taken together, form the transverse ridge of the occlusal surface of the first premolar, which forms a tri-

angular ridge, or a V-shaped ridge, the tip of the V being in the central fossa, and the arms of the V at the tip of the buccal and lingual cusp. It will then be seen that each cusp possesses two marginal ridges, a triangular ridge, and a buccal or lingual ridge. The mesio-occlusal and disto-occlusal marginal ridges of the buccal cusp join the respective mesial and distal ridges at the mesio-bucco-occlusal and disto-bucco-occlusal angles of the tooth in such a manner as to form a well-defined obtuse angle. The mesio-linguo-occlusal and disto-linguo-occlusal ridges of the lingual cusp join the mesial and lingual marginal ridges of the tooth in such a manner as to form a very indistinct angle, which gradually blends into the mesio-lingual and disto-lingual surfaces. The tip of the lingual cusp is carried more towards the center of the tooth than the tip of the buccal cusp, as a result of which the mesio-lingual and disto-lingual inclined planes of this cusp present more of a masticating surface than the mesio-buccal and disto-buccal inclined planes of the buccal cusp. In fact, the mesio-buccal and disto-buccal inclined planes of the buccal cusp are not intended as masticating inclined planes. Owing to the fact that the mesial and distal marginal ridges join the lingual marginal ridge at an obtuse angle, the lingual cusp of the upper first premolar, mesio-distally, is a crescent-shaped cusp. The occlusal surface of the upper first premolar is marked by five developmental grooves, which separate and cross the various ridges. The

grooves are named the central, mesial, distal, mesio-bucco-triangular, and disto-bucco-triangular. There is also a groove which originates from the central groove or the central fossa, and passes mesio-lingually and disto-lingually, known as the mesio-linguo-triangular and disto-linguo-triangular groove. The grooves of the occlusal surface are the mesio-bucco-triangular, disto-bucco-triangular, mesio-linguo-triangular, disto-linguo-triangular, central, mesial and distal. The central groove, which is really the central fossa, divides the triangular ridges of the buccal and lingual cusps, or may pass over them as only a slight line, in which case there will be a well marked pit on the mesial and distal side of the transverse ridge. The mesial and distal grooves, a continuation of the central groove, pass mesially and distally respectively over the mesial and distal marginal ridges. These grooves, in some instances, may be followed gingivally along the mesial and distal surfaces of the tooth. The mesial and distal grooves are rarely fissured, while in a great many instances the central groove is fissured its entire length. The mesio-bucco- and disto-bucco-triangular grooves run from the mesial and distal termination of the central groove towards the mesio-buccal and disto-buccal angles of the occlusal surface, dividing the slopes of the triangular ridge of the buccal cusp from the buccal portions of the mesial and distal marginal ridges. In the majority of upper first premolars there is a mesio-linguo- and disto-linguo-triangular

groove, which also runs from the mesial and distal end of the central fossa mesio-lingually, and disto-lingually, separating the triangular ridge of the lingual cusp from the lingual portion of the mesial and distal marginal ridges. The linguo-triangular grooves are not as well marked as the bucco-triangular grooves owing to the fact that the triangular ridge of the lingual cusp has a tendency to be flatter and to spread out and join the mesial and distal marginal ridges at a much more obtuse or rounded angle.

The Root.

The root of the upper first premolar is flattened on the mesial and distal sides, and may be divided for a third of the distance from the apex gingivally. It is very seldom that the root of the premolar is divided the entire length. In some cases only the apex is separated, as shown in Figs. 38, 39 and 40. The divisions of the root are the buccal and lingual, and when the prongs are separated for two-thirds of the distance, the apex is very slender and may be curved; when not separated and only grooved, the end of the root is blunt, with two or more foramen. In some instances, an upper premolar has three roots in which case the buccal root is the one which is divided.

Pulp Cavity.

The pulp cavity of the upper first premolar follows the same general outline as the root of the tooth. The greatest diameter is in the bucco-lin-

gual direction. The buccal and lingual portions present a point which corresponds to the buccal and lingual cusps. The pulp cavity is narrow mesio-distally and may be greatly constricted in the central portion so as to form a buccal and

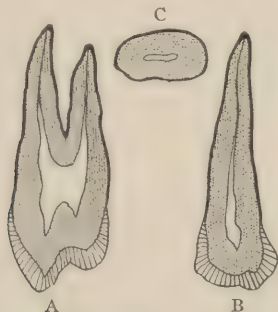


Fig. 42.—Pulp cavity of the upper first premolar. A, Bucco-lingual diameter; B, Mesio-distal diameter; C, Cross section of pulp cavity.

lingual pulp canal connected by a small isthmus. This makes the removal of the pulp more difficult. At the bifurcation of the root the pulp canal is divided into buccal and lingual portions which end at the apex in one or more foramen.

Occlusion.

The mesio-buccal and disto-buccal inclined planes of the buccal cusp of the upper first premolar have no occlusion. The mesio-lingual inclined plane of the buccal cusp of the upper first premolar occludes with the disto-buccal inclined plane of the buccal cusp of the lower first premolar. The disto-lingual inclined plane of the buccal cusp of the upper first premolar occludes

with the mesio-buccal inclined plane of the buccal cusp of the lower second premolar. The mesio-buccal inclined plane of the lingual cusp of the upper first premolar occludes with the disto-lingual inclined plane of the buccal cusp of the lower first premolar. The mesio-lingual inclined plane of the lingual cusp of the upper first premolar occludes with the disto-buccal inclined plane of the lingual cusp of the lower first premolar. The disto-buccal inclined plane of the lingual cusp of the upper first premolar occludes with the mesio-lingual inclined plane of the buccal cusp of the lower second premolar. The disto-lingual inclined plane of the lingual cusp of the upper first premolar occludes with the mesio-buccal inclined plane of the lingual cusp of the lower second premolar.

Practical Consideration.

In making restoration of the upper first premolar, care must be taken to reproduce the marginal ridges, occlusal ridges, and grooves, in order to give the proper masticating surface. In mesial and distal cavities, fillings and inlays must be made with the proper proximate contact, and also with a reproduction of the marginal ridges in order to preserve the interproximal gum tissue and to assist the food in sliding out from the occlusal surface of the teeth into the oral cavity. Owing to the fact that the crown of the tooth at the proximate contact is much wider than it is at the gingival margin, great care must be

observed in the preparation of the root in making a crown in order to secure a proper fitting of the crown with the neck of the root. All crowns of whatever kind should reproduce the gingival ridge in order to protect the gum against the food during mastication.

LOWER FIRST PREMOLAR, OR BICUSPID.

The lower first premolar is located between the lower canine and lower second premolar, and proximates the distal surface of the lower canine and the mesial surface of the lower second premolar. It is the smallest of the premolars and, in that respect, differs from the upper first premolar, which is the largest of the upper premolars.

Buccal Surface.

The buccal surface of the lower first premolar is convex in all directions with the greatest amount of convexity near the gingival third, and is so curved as to throw the tip of the buccal cusp very near the center of the tooth. The convexity of the buccal surface of the lower premolar, occluso-gingivally, is greater than it is in the upper first premolar. The tip of the cusp of the buccal surface is generally located slightly distal to the center. The buccal surface is bounded by five line angles and five point angles, of which the gingival line angle is convex, with the convexity towards the root; it is not as convex as in

the lower canine or upper first premolar. The buccal ridge of the buccal cusp runs from the tip of the cusp gingivally and divides the buccal sur-

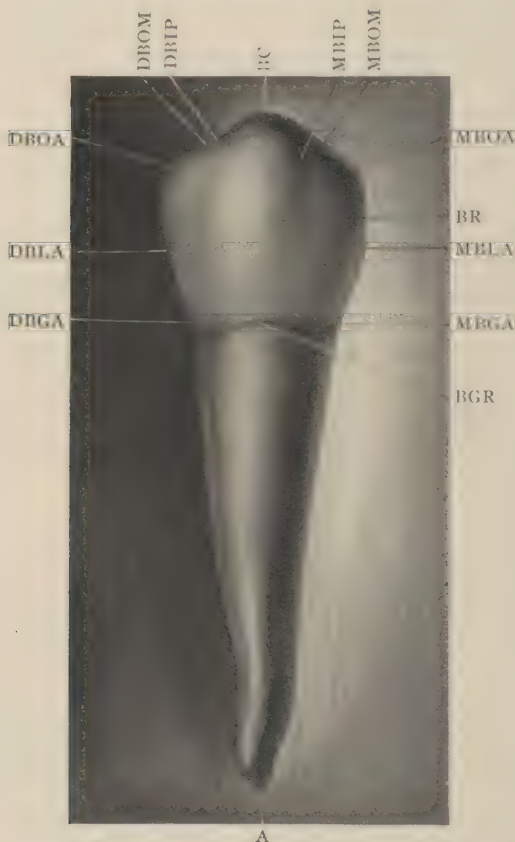


Fig. 43.—Buccal surface of the lower right first premolar. DBOA, Disto-bucco-occlusal angle; DBLA, Disto-buccal line angle; DRGA, Disto-bucco-gingival angle; A, Apex of root; BGR, Bucco gingival ridge; MBGA, Mesio-bucco-gingival angle; MBLA, Mesio-buccal line angle; BR, Buccal ridge; MBOA, Mesio-bucco-occlusal angle; MBOM, Mesio-bucco-occlusal margin; MBIP, Mesio-buccal inclined plane of buccal cusp; BC, Buccal cusp; DBIP, Disto-buccal inclined plane; DBOM, Disto-bucco-occlusal margin.

face into two inclined planes, known as the disto-buccal and mesio-buccal inclined planes. The occlusal margin of the buccal cusp is made up of the mesio-buccal and disto-buccal marginal ridges.

Lingual Surface.

The lingual surface of the lower first premolar (Fig. 44), or the lingual lobe, differs in size in various teeth. As a rule, the lingual surface is only about two-thirds as long as the buccal surface, and the occluso-lingual diameter is about three-fourths as long as the occluso-lingual diameter on the buccal surface (Figs. 43 and 44). The lingual surface is more nearly straight than the buccal surface, although there is a decided convexity near the gingival ridge, and owing to the manner in which the tooth sets in the dental arch, the convexity extends over the gum tissue to a great extent. The lingual surface is bounded by five point angles and five line angles. The line angles are the mesio-occlusal, disto-occlusal, mesial, distal, and gingival. The point angles are the mesio-occlusal, mesio-lingual, disto-lingual, disto-occlusal, and the cusp of the lingual surface. The line angles are very short in comparison with the buccal line angles. The mesio-occlusal marginal and disto-occlusal marginal ridges of the lingual cusp make up a very small portion of the occlusal surface of the lower first premolar. The lingual surface is convex mesio-distally and joins the mesial and distal surface at very ob-

tuse angles; in fact it is so nearly round that it is very difficult to say where the mesial and distal surfaces join the lingual surface. The lingual

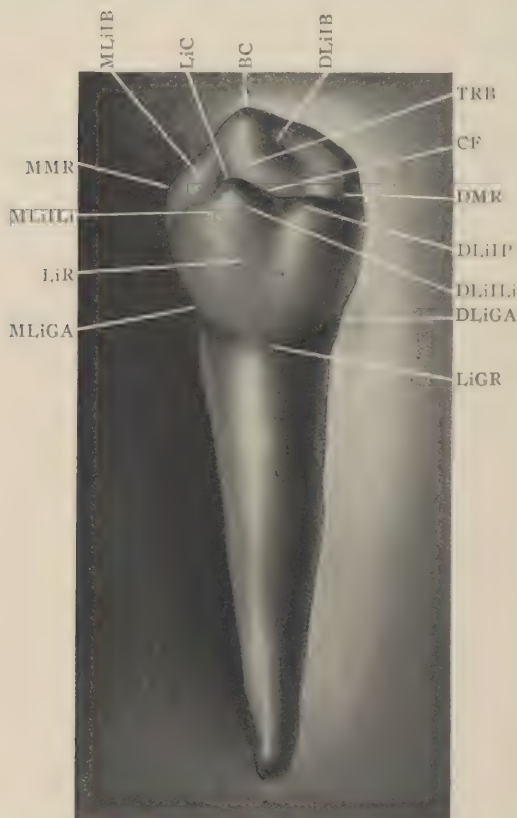


Fig. 44.—Lingual surface of the lower right first premolar. MMR, Mesial marginal ridge; MLiLi, Mesio-lingual inclined plane of the lingual cusp; LiR, Lingual ridge; MLiGA, Mesio-linguo-gingival angle; LiGR, Linguo-gingival ridge; DLiGA, Disto-linguo-gingival angle; DLiLi, Disto-lingual inclined plane of lingual cusp; DLiIP, Disto-lingual inclined plane; DMR, Distal marginal ridge; CF, Central fossa; TRB, Triangular ridge of buccal cusp; DLiB, Disto-lingual inclined plane of buccal cusp; BC, Buccal cusp; LiC, Lingual cusp; MLiB, Mesio-lingual inclined plane of buccal cusp.

surface is divided by the lingual ridge, crossing it occluso-lingivally from the tip of the cusp to the gingival angle. The gingival margin of the lingual surface is almost straight, or is slightly convex, with the convexity towards the root. The lingual surface is only about one-half or two-thirds as large as the buccal surface. Looking at the tooth from the lingual side (Fig. 44) most all of the linguo-occlusal surface of the buccal cusp is in view except a small portion of the central fossa and pit. Owing to the small size of the lingual surface the tooth presents little masticating surface.

Mesial and Distal Surfaces.

The mesial and distal surfaces of the lower first premolar are bounded by four line angles and four point angles. The line angles are the occlusal, buccal, lingual, and gingival; the point angles, the bucco-occlusal, bucco-lingival, linguo-lingival, and linguo-occlusal. The buccal line angle is much longer than any of the other line angles; the next in length being the gingival. The gingival line angle or gingival margin of the mesial and distal surface is very nearly a straight line, or it may be slightly concave, with the concavity towards the root. The occlusal line angle of the mesial surface is formed by the mesial marginal ridge and the mesio-occlusal ridges of the buccal and lingual cusps. The mesial marginal ridge is concave, with the concavity towards the occlusal surface. The same relative proportion

of the line angles is true on the distal surfaces. The mesial and distal surfaces are convex bucco-lingually, and they are convex ocluso-gingivally in the occlusal third, but the gingival two-thirds may become concave or flattened.

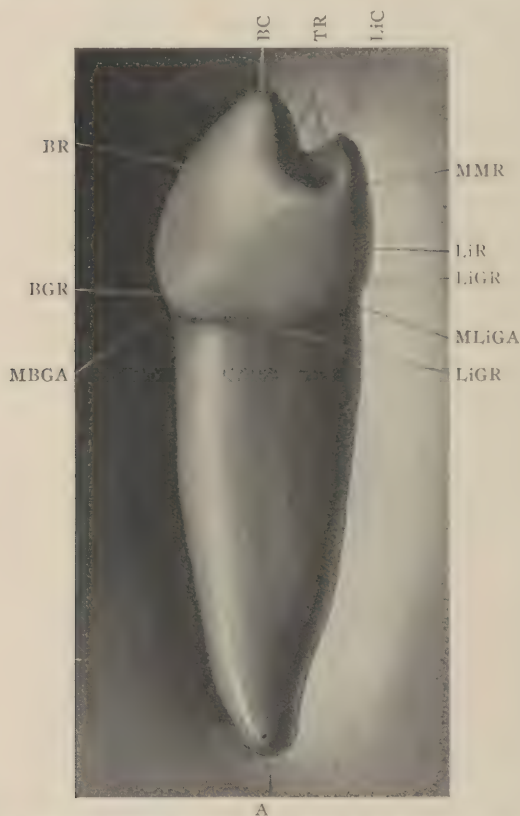


Fig. 45.—Mesial surface of the lower right first premolar. BR, Buccal ridge; BGR, Bucco-gingival ridge; MBGA, Mesio-bucco gingival angle; A, Apex of root; LiGR, Linguo-gingival ridge; MLiGA, Mesio-linguo-gingival angle; LiGR, Linguo-gingival ridge; LiR, Lingual ridge; MMR, Mesial marginal ridge; LiC, Lingual cusp; TR, Triangular ridges; BC, Buccal cusp.

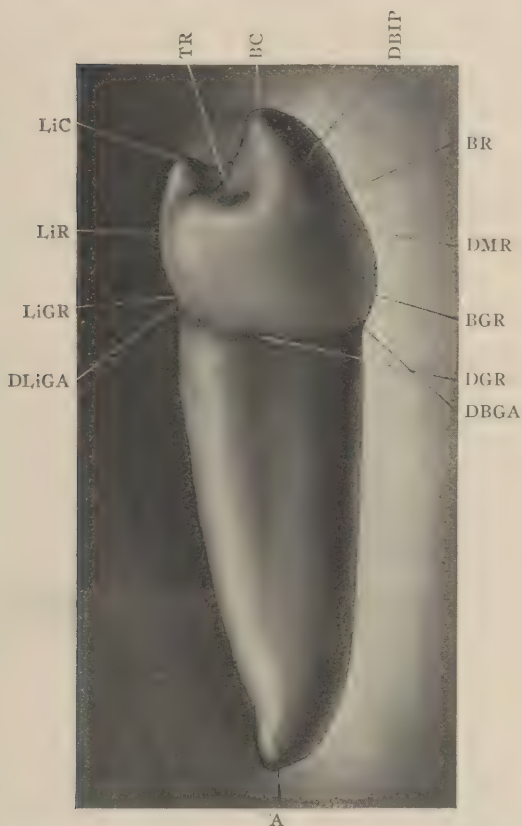


Fig. 46.—Distal surface of the lower right first premolar. LiC, Lingual cusp; LiR, Lingual ridge; LiGR, Linguo-gingival ridge; DLiGA, Disto-linguo-gingival angle; A, Apex of root; DBGA, Disto-bucco-gingival angle; DGR, Disto-gingival ridge; BGR, Bucco-gingival ridge; DMR, Disto-marginal ridge; BR, Buccal ridge; DBIP, Disto-buccal inclined plane of buccal cusp; BC, Buccal cusp; TR, Triangular ridge.

Occlusal Surface.

The occlusal surface of the lower first premolar, or bicuspid, differs from that of the upper first premolar, owing to the fact that the buccal cusp

of the lower first premolar is much larger than the lingual cusp. The buccal cusp of the lower first premolar occupies about four-fifths of the occlusal surface of the tooth. The tip of the buccal cusp is very near the center of the tooth, and occupies a position near the center when the tooth is viewed from the occlusal surface. The buccal cusp is marked by four ridges, the buccal, mesio-occlusal marginal, disto-occlusal marginal, and triangular. The buccal ridge arises at the tip of the buccal cusp and passes bucco-lingually to the gingival marginal ridge, dividing the buccal surface of the buccal cusp into two inclined planes, the mesio-buccal and disto-buccal inclined planes. The buccal inclined planes of the buccal cusp are the largest of any of the occlusal inclined planes of the lower first premolar, and present the greatest amount of masticating surface of any of the planes of either the buccal or lingual cusp. The mesio-occlusal marginal ridge of the buccal cusp passes from the tip of the cusp mesially, and joins the mesial marginal ridge at the mesio-bucco-occlusal angle of the tooth, which is very near the center of the occlusal surface, bucco-lingually. The disto-occlusal marginal ridge passes distally and joins the distal marginal ridge at the disto-bucco-occlusal margin of the tooth, which is also very near the bucco-lingual center of the tooth. The triangular ridge of the buccal cusp passes from the tip of the buccal cusp linguo-lingually to and is crossed by the central fossa or joins the triangular ridge of the lingual cusp. The trian-

gular ridge of the buccal cusp divides the lingual surface of the buccal cusp into two inclined planes, the mesio-lingual and disto-lingual inclined planes of the buccal cusp. The triangular ridge of the buccal cusp, or the bucco-triangular ridge of the occlusal surface is very prominent, and joins the triangular ridge of the lingual cusp, or the linguo-

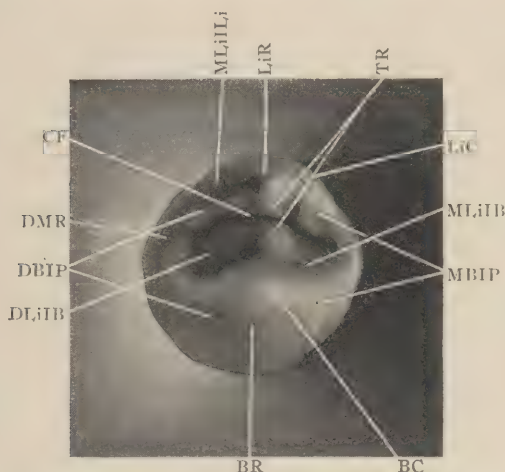


Fig. 47.—Occlusal surface of the lower right first premolar. CF, Central fossa; DMR, Distal marginal ridge; DBIP, Disto-buccal inclined planes of buccal and lingual cusps; DLiIB, Disto-lingual inclined plane of buccal cusp; BR, Buccal ridge; BC, Buccal cusp; MBIP, Meso-buccal inclined planes of buccal and lingual cusps; MLiIB, Meso-lingual inclined plane of buccal cusp; LiC, Lingual cusp; TR, Triangular ridges; LiR, Lingual ridge; MLiLi, Meso-lingual inclined plane of lingual cusp.

triangular ridge at the central fossa, and the two triangular ridges form the transverse ridge of the occlusal surface. The grooves of the occlusal surface of the lower first premolar are the central, mesial, distal; the mesio- and disto-bucco-triangular, and mesio- and disto-linguo-triangular

grooves. The central groove separates the two triangular ridges of the buccal and lingual cusps and terminates in the mesial and distal grooves, which pass over the mesial and distal marginal ridges of the tooth. The central fossa, or central groove of the lower first premolar is usually crescent-shaped, with the convexity towards the lingual cusp. The ends of the crescent are continued outward by the mesial and distal grooves. The mesio-bucco-triangular and disto-bucco-triangular grooves run respectively towards the mesio-buccal and the disto-buccal angles of the occlusal surface. The linguo-triangular grooves are not very well developed in the lower first premolar, but they pass mesio-lingually and disto-lingually towards the mesio-linguo-occlusal angle and disto-linguo-occlusal angle of the crown of the tooth. Owing to the fact that the buccal cusp of the lower first premolar and the mesio-bucco-occlusal marginal and the disto-bucco-occlusal marginal ridges are near the center of the tooth, the mesial and distal marginal ridges of the occlusal surface of the lower first premolar are much shorter than they are in any of the other premolars. They join the linguo-occlusal marginal ridges at very obtuse angles. In fact, the mesio-lingual and disto-lingual marginal ridges join the mesial and distal marginal ridges so as to form a crescent, and, in a great many lower first premolars, the lingual cusp is nothing more than a continuation of the lingual marginal ridges.

The Root.

The root of the lower first premolar tapers gradually towards the apex, and is flattened on the mesial and distal sides. Its greatest diameter is bucco-lingually. The buccal portion of the root forms an arc of a circle, and the mesial and distal sides converge towards the lingual, so that the lingual surface of the root is narrower than the buccal surface. The root joins the crown of the tooth at the gingival marginal ridge, and the width of the crown at the gingival marginal ridge is considerably wider than the root of the tooth. The mesio-distal diameter of the crown is much greater in comparison with the mesio-distal diameter of the root than the bucco-lingual diameter of the crown. Bucco-lingually, the gingival marginal ridge is well developed, forming a constriction at the neck of the tooth, and the convexity of the gingival marginal ridge protects the gingival gum tissue.

Pulp Cavity.

The pulp canal of the lower first premolar follows the general outline of the shape of the root, and the greatest diameter is bucco-lingually. The pulp canal is generally a single pulp canal, although in some instances it may be constricted in the center and shaped like the figure eight, or, in other words, flattened on the mesial and distal sides. The pulp cavity is much larger in newly erupted teeth than in the teeth of old people. Fig.

48-B is made from the tooth of a person quite old. There may be one or more openings at the apex.

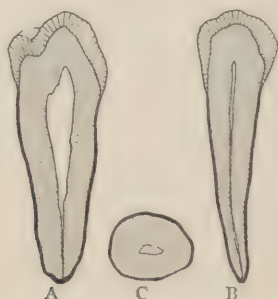


Fig. 48.—Pulp cavity of the lower right first premolar. A, Bucco-lingual diameter; B, Mesio-distal diameter; C, Cross section of pulp cavity.

Occlusion.

The mesio-buccal inclined plane of the buccal cusp of the lower first premolar occludes with the distal-lingual inclined plane of the upper canine. The disto-buccal inclined plane of the buccal cusp of the lower first premolar occludes with the mesio-lingual inclined plane of the buccal cusp of the upper first premolar. The mesio-lingual inclined plane of the buccal cusp of the lower first premolar and the mesial inclined planes of the lingual cusp have no occlusion. The disto-lingual inclined plane of the buccal cusp of the lower first premolar occludes with the mesio-buccal inclined plane of the lingual cusp of the upper first premolar. The disto-buccal inclined plane of the lingual cusp of the lower first premolar occludes with the mesio-lingual inclined plane of the lingual cusp of the upper first premolar. The disto-

lingual inclined plane of the lingual cusp of the lower first premolar has no occlusion.

Practical Consideration.

The large amount of convexity of the mesial and distal surfaces of the lower first premolar necessitates great care in the restoration of these surfaces. Owing to the fact that the crown of the lower first premolar is decidedly bell-shaped, the diameter at the proximate contact is much greater than it is at the root, and great care must be observed in making restoration of the same, or in making crowns so as to fit the root at the gingival portion and then contouring the crown to give the proper convexity to the mesial and distal surfaces, thereby restoring their proximate contact with the approximating teeth. In fitting bands on the lower first premolar for orthodontic purposes, the large convexity at the proximate contact point makes it imperative that great care be exercised to prevent the gingival portion of the band from infringing upon the gingival gum tissue. The large convexity of the buccal cusp and the great occluso-gingival diameter of the buccal surface as compared to the diameter of the lingual surface renders it necessary to follow a different technic or exercise a greater amount of care in making crowns for the first premolar than for any of the other premolars. Owing to the fact that the central fossa of the tooth is carried over to the lingual when opening into the pulp canal, care must be taken in approaching from the occlusal

surface to direct the instrument towards the buccal, or the instrument may pass through the lingual side of the tooth near the gingival marginal ridge and enter the alveolus. Not only is the crown tipped towards the lingual, but, as compared to the root, the crown of the tooth is inclined towards the lingual as it sets in the dental arch. This gives a large amount of convexity to the lingual surface, as the tooth sets in the arch, and is the reason that so much care should be observed in entering the pulp canal from the occlusal. The gingival marginal ridges should be very accurately reproduced, especially the convexity on the buccal and lingual sides in order to protect the gum tissue from food.

UPPER SECOND PREMOLAR, OR BICUSPID.

The upper second premolar possesses the same surfaces as the upper first premolar, and more nearly resembles the upper first premolar than any of the other premolars. The upper second premolar is slightly smaller than the first in all dimensions, the root is generally a single root, presenting but one apex, and the pulp canal a single pulp canal, or at least only flattened.

Buccal Surface.

The buccal surface of the upper second premolar presents five line angles and five point angles, named similar to those in the upper first pre-

molar. The mesio-occlusal angle of the buccal surface is shorter than the disto-occlusal angle of the buccal surface, as a result of which the tip of the buccal cusp of the upper second premolar

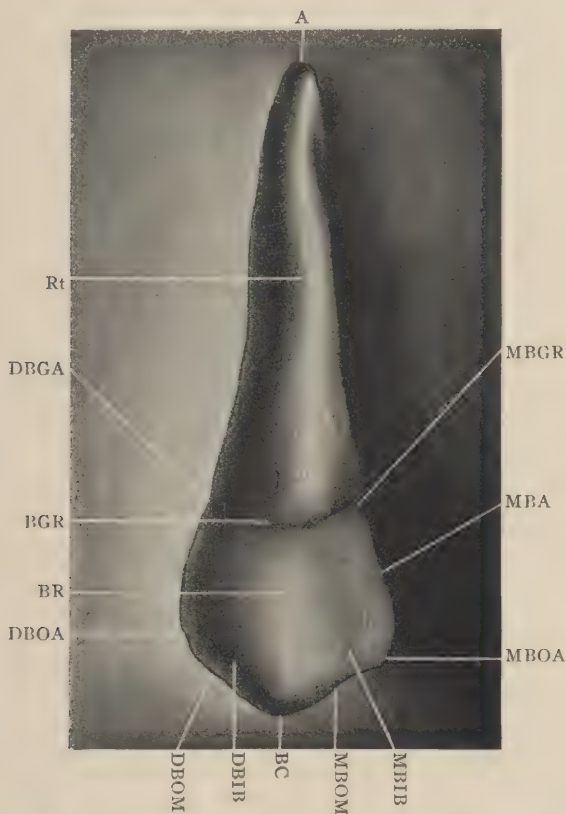


Fig. 49.—Buccal surface of the upper right second premolar. Rt, Root; DBGA, Disto-bucco-gingival angle; BGR, Bucco-gingival ridge; BR, Buccal ridge; DBOA, Disto-bucco-occlusal angle; DBOM, Disto-bucco-occlusal margin; DBIB, Disto-buccal inclined plane of buccal cusp; BC, Buccal cusp; MBOM, Mesio-bucco-occlusal margin; MBIB, Mesio-buccal inclined plane of buccal cusp; MBOA, Mesio-bucco-occlusal angle; MBA, Mesio-buccal line angle; MBGR, Mesio-bucco-gingival ridge; A, Apex of root.

is situated nearer the mesial than the distal. The mesial and distal line angles of the buccal surface do not converge towards the gingival as much as

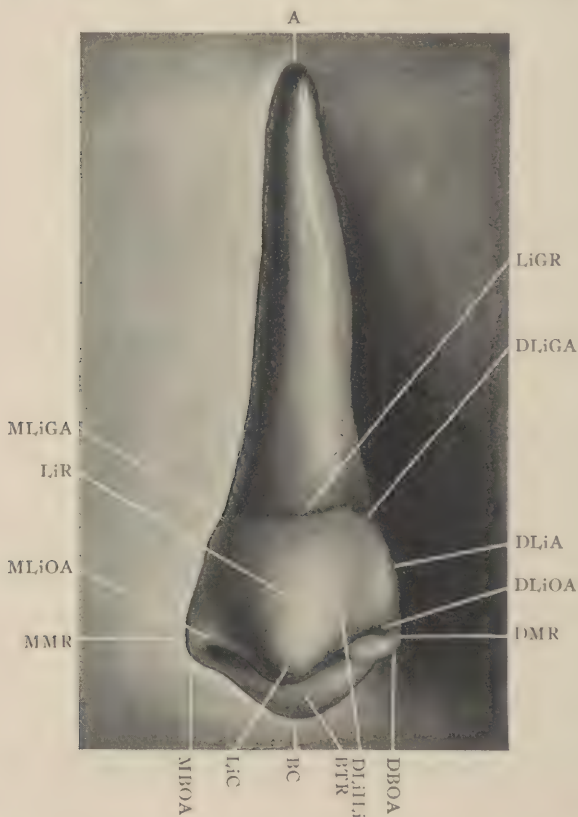


Fig. 50.—Lingual surface of the upper right second premolar. MLiGA, Mesio-linguo-gingival angle; LiR, Lingual ridge; MLiOA, Mesio-linguo-occlusal angle; MMR, Mesial marginal ridge; MBOA, Mesio-bucco-occlusal angle; LiC, Lingual cusp; BC, Buccal cusp; BTR, Bucco-triangular ridge; DLiLi, Disto-lingual inclined plane of lingual cusp; DBOA, Disto-bucco-occlusal angle; DMR, Disto-marginal ridge; DLiOA, Disto-linguo-occlusal angle; DLiA, Disto-lingual line angle; DLiGA, Disto-linguo-gingival angle; LiGR, Linguo-gingival ridge; A, Apex of root.

they do on the upper first premolar, and consequently the upper second premolar is not as bell-shaped, or does not present as much of a constriction at the gingival as the upper first premolar. The buccal ridge of the buccal surface is not as well developed as it is in the first premolar, so, as a rule, the convexity mesio-distally is not as great. The mesio-occlusal and disto-occlusal angles of the buccal surface approach each other at more of an obtuse angle, so that the tip of the buccal cusp is not as sharp as it is in the first premolar.

Lingual Surface.

The lingual surface of the upper second premolar presents the same outline as the first premolar, although the mesio-occlusal and disto-occlusal borders of the lingual surface usually approach each other at more of an obtuse angle, so that the tip of the cusp is more rounded than it is in the upper first premolar. Owing to the development of the lingual cusp on the lower second premolar, the lingual cusp of the upper second premolar has more of an occlusion than the lingual cusp of the upper first premolar, which results in the lingual cusp of the upper second premolar being worn to a greater extent in aged persons than the lingual cusp of the upper first premolar. The tip of the lingual cusp is nearer the mesial surface than the distal surface. The lingual surface joins the mesial and distal surfaces as well rounded or obtuse angles.

Mesial and Distal Surfaces.

The mesial and distal surfaces of the upper second premolar present the same line angles and point angles as the corresponding surfaces of the upper first premolars. The gingival marginal

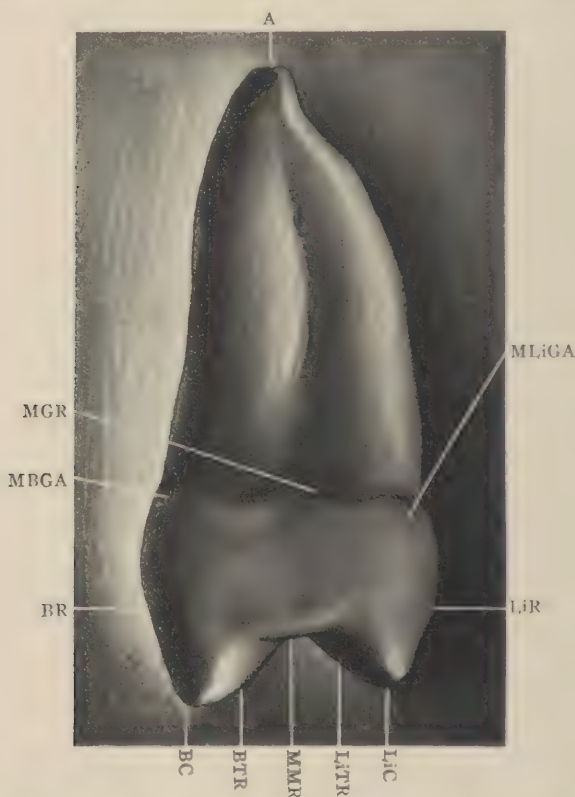


Fig. 51.—Mesial surface of the upper right second premolar. MGR, Mesio-lingual ridge; MBGA, Mesio-bucco-gingival angle; BR, Buccal ridge; BC, Buccal cusp; BTR, Bucco-triangular ridge; MMR, Mesio-marginal ridge; LiTR, Linguo-triangular ridge; LiC, Lingual cusp; LiR, Lingual ridge; MLiGA, Mesio-linguo-gingival angle; A, Apex of root.

ridge is well developed, and is convex, with the convexity towards the occlusal, or it may be very nearly a straight line. The surfaces are convex in all directions, although not as convex as the mesial and distal surfaces of the upper first pre-

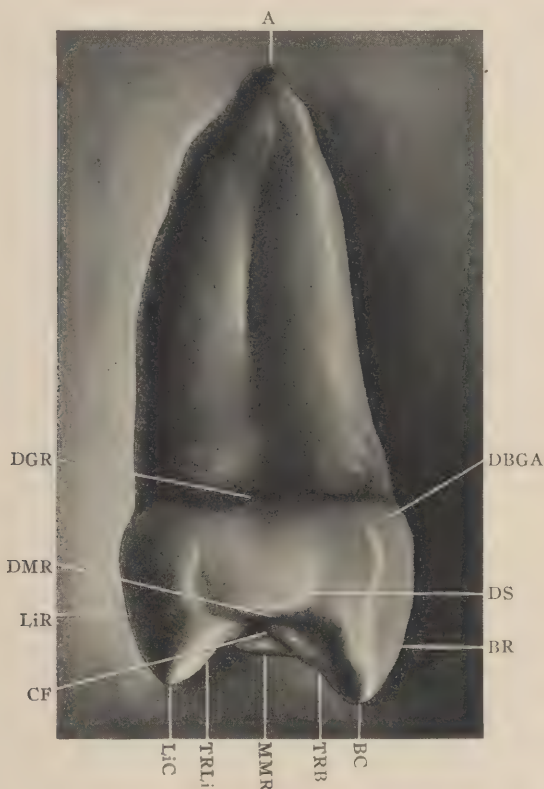


Fig. 52.—Distal surface of the upper right second premolar. DGR, Disto-gingival ridge; DMR, Distal marginal ridge; LiR, Lingual ridge; CF, Central fossa; LiC, Lingual cusp; TRLi, Triangular ridge of lingual cusp; MMR, Mesial marginal ridge; TRB, Triangular ridge of buccal cusp; BC, Buccal cusp; BR, Buccal ridge; DS, Distal surface; DBGA, Disto-bucco-gingival angle; A, Apex of root.

molar. It is very seldom that a concavity appears on the mesial or distal surface of the upper second premolar.

Occlusal Surface.

The occlusal surface of the upper second premolar presents the same ridges and grooves as

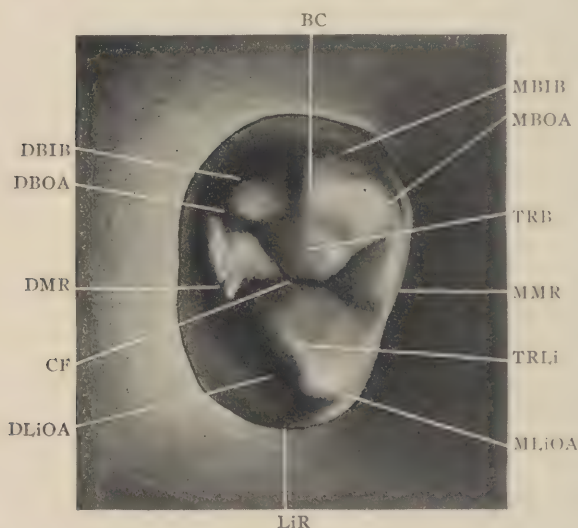


Fig. 53.—Occlusal surface of the upper right second premolar. DBIB, Disto-buccal inclined plane of buccal cusp; DBOA, Disto-bucco-occlusal angle; DMR, Distal marginal ridge; CF, Central fossa; DLiOA, Disto-linguo-occlusal angle; LiR, Lingual ridge; MLiOA, Mesio-linguo-occlusal angle; TRLi, Triangular ridge of lingual cusp; MMR, Mesial marginal ridge; TRB, Triangular ridge of buccal cusp; MBOA, Mesio-bucco-occlusal angle; MBIB, Mesio-buccal inclined plane of buccal cusp; BC, Buccal cusp.

the upper first premolar, but owing to the fact that the cusps of the upper second premolar are not so well developed the marginal ridges are proportionately broader in the upper second pre-

molar. The central fossa is shorter and the mesial and distal pits, or grooves, are closer together. The distal marginal ridge joins the disto-linguo-occlusal marginal ridge at an obtuse angle so as to give the disto-lingual surface of the crown a very sloping appearance, and bring the tip of the lingual cusp to the mesial of the center of the tooth. The mesio-bucco- and disto-bucco-occlusal angles of the upper second premolar is more obtuse and not as sharp and well defined as in the upper first premolar.

The Root.

The root of the upper second premolar is slightly longer than the root of the upper first premolar, because the crown is shorter. The root is rarely divided, but may be grooved on the mesial or distal side, and if a concavity develops on the mesial side of the crown, there is a tendency for the root to be grooved on the mesial side. There may be a bifurcation of the root near the apical third, generally resulting from the groove, which develops on the mesial side more often than on the distal. The bucco-lingual diameter of the root is much greater than the mesio-distal diameter, and ends in a rounded or blunt apex. The root is very often curved at the apex due to the fact that this is the last premolar to erupt, and it may encounter more or less impaction during the process of eruption, which probably influences the curvature of the root.

Pulp Cavity.

The pulp canal follows the same general outline as the root, with the occlusal portion of the pulp canal presenting two papillæ corresponding to the buccal and lingual cusps. The greatest diameter of the pulp canal is in the region of the gingival ridge of the crown from which it gradually tapers

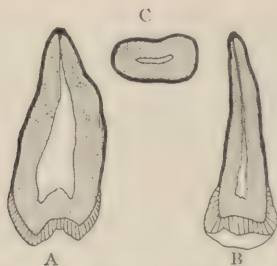


Fig. 54.—Pulp cavity of the upper right second premolar. A, Bucco-lingual diameter; B, Mesio-distal diameter; C, Cross section of pulp cavity.

towards the apex, being much wider bucco-lingually than it is mesio-distally. There is a tendency for the central portion of the pulp canal to be constricted so as to present a buccal and lingual canal, which may be entirely separated or connected by a small isthmus of pulp tissue.

Occlusion.

The mesio-buccal and disto-buccal inclined planes of the buccal cusp have no occlusion. The mesio-lingual inclined plane of the buccal cusp of the upper second premolar occludes with the disto-buccal inclined plane of the buccal cusp of the

lower second premolar. The disto-lingual inclined plane of the buccal cusp of the upper second premolar occludes with the mesio-buccal inclined plane of the mesio-buccal cusp of the lower first molar. The mesio-buccal inclined plane of the lingual cusp of the upper second premolar occludes with the disto-lingual inclined plane of the buccal cusp of the lower second premolar. The mesio-lingual inclined plane of the lingual cusp of the upper second premolar occludes with the disto-buccal inclined plane of the lingual cusp of the lower second premolar. The disto-buccal inclined plane of the lingual cusp of the upper second premolar occludes with the mesio-lingual inclined plane of the mesio-buccal cusp of the lower first molar. The disto-lingual inclined plane of the lingual cusp of the upper second premolar occludes with the mesio-buccal inclined plane of the mesio-lingual cusp of the lower first molar.

Practical Consideration.

The same points that have been mentioned in regard to the upper first premolar apply equally as well to the upper second premolar.

LOWER SECOND PREMOLAR, OR BICUSPID.

The lower second premolar is a little larger than the lower first premolar, and, in fact, the size of the tooth differs with the shape of the

crown. The lower second premolar presents three characteristic outlines, all of which may be said to be typical. The occlusal surfaces can be seen in Figs. 59, 60, and 61. Of the three forms of teeth that are shown, Fig. 59 is found more frequently; those represented in Figs. 60 and 61 will be found distributed about equally. The principle points of difference between the lower second premolar and the lower first premolar is that the lower second premolar has a better developed lingual surface, and the lingual cusp is proportionately higher and covers a greater amount of the occlusal surface, but is not as large as the lingual cusp on the upper premolars. It will be seen that the different forms of the occlusal surface, to a certain extent, change the size of the buccal and lingual surfaces, but this will be mentioned under the description of the occlusal surface.

Buccal Surface.

The buccal surface of the lower second premolar presents five point angles and five line angles. The line angles are the mesio-occlusal, mesial, gingival, distal, and disto-occlusal. The point angles are the mesio-occlusal, mesio-gingival, disto-gingival, disto-occlusal, and the cusp. The buccal surface of the lower second premolar is convex in all directions, with the greatest amount of convexity near the gingival border. The occlusal third of the buccal surface presents two large occlusal inclines which occlude with the upper pre-

molars. Comparatively, the occluso-gingival diameter of the lower second premolars is shorter than the other premolars, and the buccal cusp is

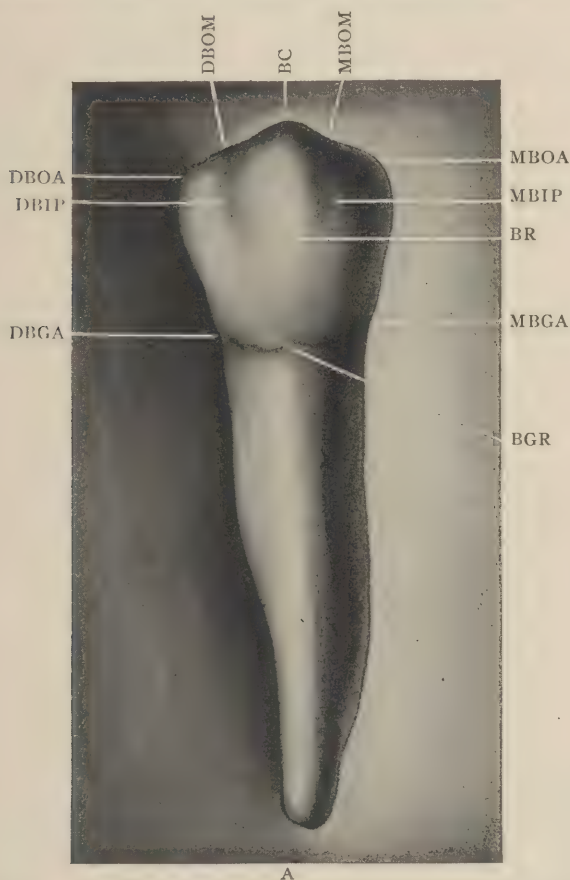


Fig. 55.—Buccal surface of the lower right second premolar. DBOA, Disto-bucco-occlusal angle; DBIP, Disto-buccal inclined plane; DBGA, Disto-bucco-gingival angle; A, Apex of root; BGR, Bucco-gingival ridge; MBGA, Mesio-bucco-gingival angle; BR, Buccal ridge; MBIP, Mesio-buccal inclined plane; MBOA, Mesio-bucco-occlusal angle; MBOM, Mesio-bucco-occlusal margin; BC, Buccal cusp; DBOM, Disto-bucco-occlusal margin.

not as high, owing to the fact that it falls in the occlusal embrasure between the upper premolars. The buccal surface is crossed by a large buccal ridge, which divides it into two inclined planes, the mesio-bucco- and disto-bucco-occlusal inclined planes. The gingival marginal ridge of the buccal surface is convex, with the convexity towards the apex, and the mesial and distal margins converge towards the gingival border almost equally, although, as a rule, the distal surfaces converge a little more rapidly than the mesial surfaces. The central developmental lobe is the largest, and the developmental grooves are located near the mesial and distal angles of the tooth.

Lingual Surface.

The lingual surface of the lower second premolar presents the same line angles and point angles as the buccal surface, with the exception that they are all shorter and the gingival line angle is more nearly straight and not as convex as it is on the buccal surface. The lingual surface is crossed by a lingual ridge, which runs from the tip of the cusp occluso-gingivally to the gingival border, and divides the lingual surface into two inclined planes. The inclined planes of the lingual surface are not nearly as large as the inclined planes of the buccal surface, as they have no occlusion. The lingual surface of the lower second premolar is decidedly convex, occluso-gingivally, with the greatest amount of convexity near the

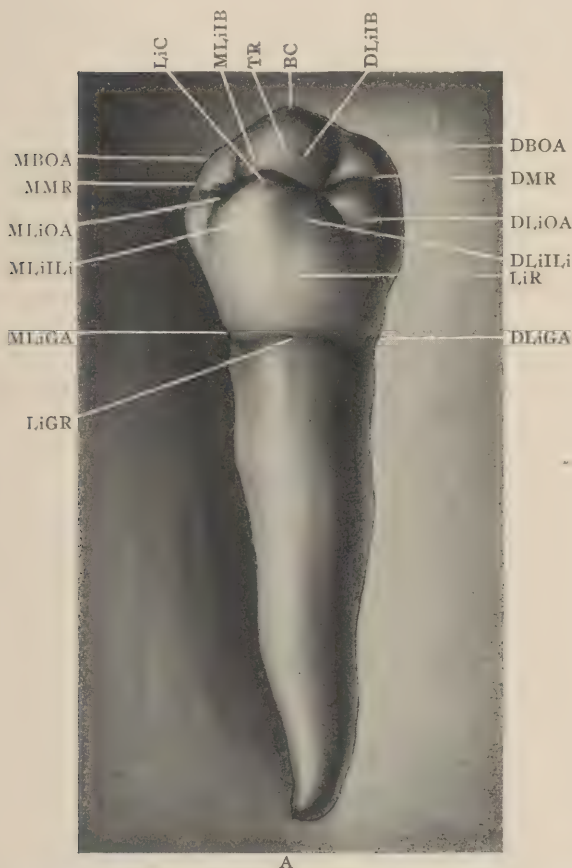


Fig. 56.—Lingual surface of the lower right second premolar. MBOA, Mesio-bucco-occlusal angle; MMR, Mesial marginal ridge; MLiOA, Mesio-linguo-occlusal angle; MLiILi, Mesio-lingual inclined plane of lingual cusp; MLiGA, Mesio-linguo-gingival angle; LiGR, Linguo-gingival ridge; A, Apex of root; DLiGA, Disto-linguo-gingival angle; LiR, Lingual ridge; DLiILi, Disto-lingual inclined plane of lingual cusp; DLiOA, Disto-linguo-occlusal angle; DMR, Disto-marginal ridge; DBOA, Disto-bucco-occlusal angle; DLiIB, Disto-lingual inclined plane of buccal cusp; BC, Buccal cusp; TR, Triangular ridge; MLiIB, Mesio-lingual inclined plane of buccal cusp; LiC, Lingual cusp.

occlusal third. The lingual surface of the lower premolar, shown in Fig. 60, is much wider mesio-distally than the buccal surface.

Mesial and Distal Surfaces.

The mesial and distal surfaces of the lower second premolar, or bicuspid, are bounded by four point angles and four line angles. The point angles of the mesial and distal surfaces are the bucco-occlusal, bucco-lingual, linguo-lingual, and linguo-occlusal. The line angles are the occlusal, buccal, lingual, and gingival. The occlusal line angle of both the mesial and distal surface is concave, with the concavity occlusal. The buccal line angle is convex, with the greatest convexity near the gingival border, and a long inclined slope from the gingival third occlusally. The lingual line angle is convex, with the greatest convexity near the occlusal surface, after which it gradually slopes gingivally. The gingival border is concave, with the concavity towards the root, or it may be almost straight. The occlusal border of either the mesial or distal surface may be crossed with one or more of the grooves which leave the central fossa, and in some instances it is crossed only by the mesial, or distal, groove. In others the occlusal margin of the mesial, or distal, surface is crossed by both the bucco-triangular and linguo-triangular grooves. The mesial and distal surfaces are generally convex bucco-lingually, with the greatest convexity near the buccal third.

They are also convex ocluso-lingivally, with the greatest convexity near the oclusal portion, and

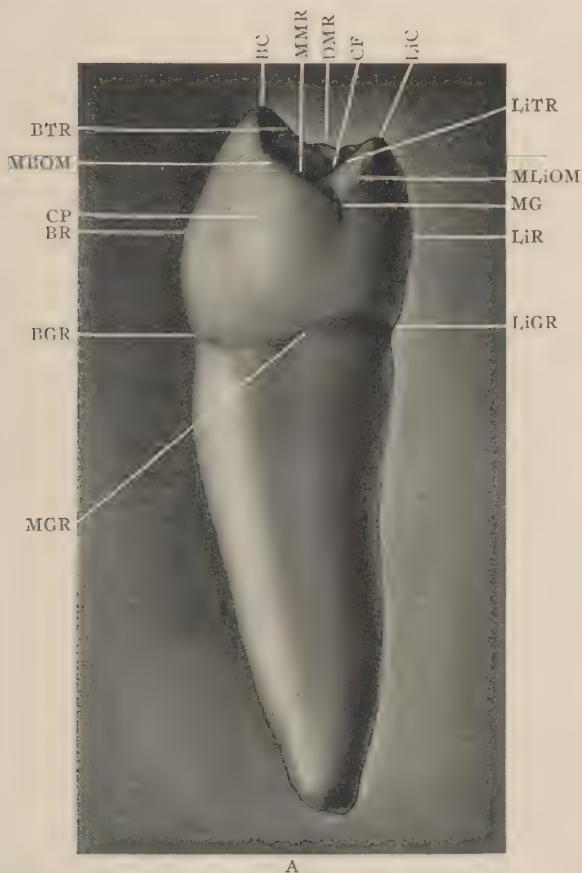


Fig. 57.—Mesial surface of the lower right second premolar. BTR, Bucco-triangular ridge; MBOM, Mesio-bucco-occlusal margin; CP, Contact point; BR, Buccal ridge; BGR, Bucco-gingival ridge; MGR, Mesio-gingival ridge; A, Apex of root; LiGR, Linguo-gingival ridge; LiR, Lingual ridge; MG, Mesial groove; MLiOM, Mesio-linguo-occlusal margin; LiTR, Linguo-triangular ridge; LiC, Lingual cusp; CF, Central fossa; DMR, Distal marginal ridge; MMR, Mesial marginal ridge; BC, Buccal cusp.

they may be flattened or even concave near the gingival third.

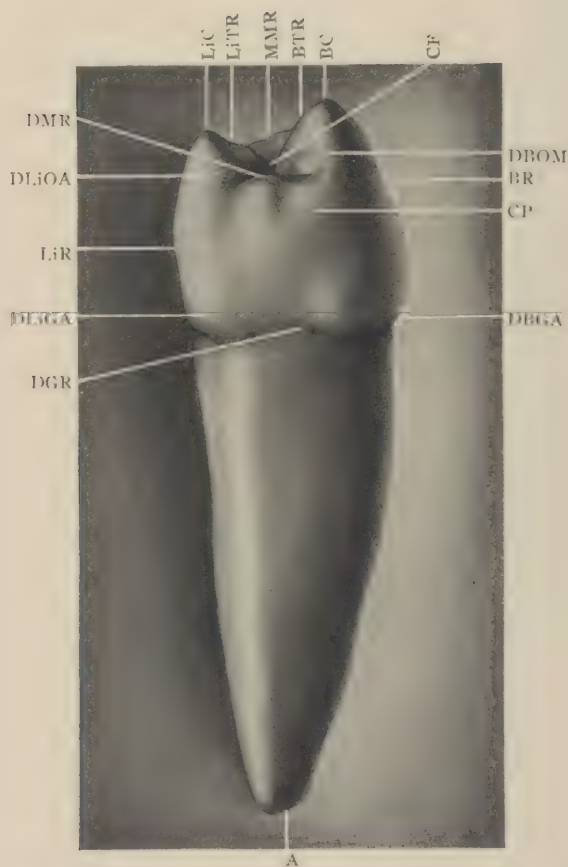


Fig. 58.—Distal surface of the lower right second premolar. DMR, Distal marginal ridge; DLiOA, Disto-linguo-occlusal angle; LiR, Lingual ridge; DLiGA, Disto-linguo-gingival angle; DGR, Disto-gingival ridge; A, Apex of root; DBGA, Disto-bucco-gingival angle; CP, Contact point; BR, Buccal ridge; DBOM, Disto-bucco-occlusal margin; CF, Central fossa; BC, Buccal cusp; BTR, Bucco-triangular ridge; MMR, Mesial marginal ridge; LiTR, Linguo-triangular ridge; LiC, Lingual cusp.

Occlusal Surface.

In describing the occlusal surface of the lower second premolar, or bicuspid, it must be remembered that there are three typical forms of teeth, and in these forms, of course, the greatest difference is noticeable on the occlusal surface. In

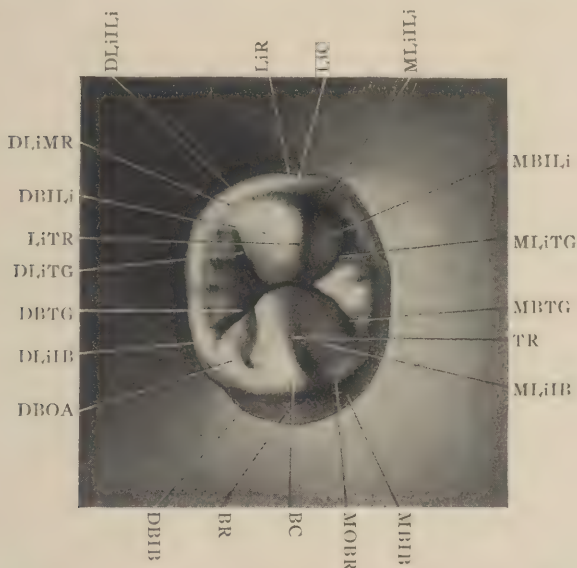


Fig. 59.—Occlusal surface of the lower second premolar. DLiMR, Disto-lingual marginal ridge; DBILi, Disto-buccal incline of lingual cusp; LiTR, Linguo-triangular ridge; DLiTG, Disto-linguo-triangular groove; DBTG, Disto-bucco-triangular groove; DLiIB, Disto-linguo-occlusal inclined plane of buccal cusp; DBOA, Disto-bucco-occlusal angle; DBIB, Disto-buccal inclined plane of buccal cusp; BR, Buccal ridge; BC, Buccal cusp; MOBR, Mesio-occluso-buccal ridge; MBIB, Mesio-buccal inclined plane of buccal cusp; MLiIB, Mesio-lingual inclined plane of buccal cusp; TR, Triangular ridge; MBTG, Mesio-bucco-triangular groove; MLiTG, Mesio-linguo-triangular groove; MBILi, Mesio-buccal inclined plane of lingual cusp; MLiLi, Mesio-lingual inclined plane of lingual cusp; LiC, Lingual cusp; LiR, Lingual ridge; DLiLi, Disto-lingual inclined plane of lingual cusp.

the typical occlusal surface, as shown in Fig. 59, there is presented for study two cusps, the buccal

and lingual, which are well developed in the lower second premolar of this type.

The buccal cusp is made up of four ridges: the buccal ridge, which runs from the tip of the cusp gingivally; the triangular ridge, which runs from the tip of the cusp linguo-gingivally to the central fossa; and the two occlusal marginal ridges, the bucco-occlusal and disto-occlusal ridges, which start from the tip of the cusp and run respectively mesially and distally. The buccal ridge divides the occlusal surface into the mesio-buccal and disto-buccal inclined planes of the buccal cusp. The triangular ridge divides the lingual surface of the buccal cusp into the mesio-lingual and disto-lingual inclined planes. The ridges of the lingual cusp are as follows: The lingual ridge, which runs linguo-gingivally, dividing the linguo-occlusal surface into two inclined planes, the mesio-lingual and disto-lingual inclined planes of the lingual cusp. The triangular ridge of the lingual cusp, which runs bucco-gingivally to the central fossa, divides the buccal surface of the lingual cusp into two inclined planes known as the mesio-buccal and disto-buccal inclined planes. The buccal and lingual inclined planes of the lingual cusp are separated by the mesio-occlusal and disto-occlusal marginal ridges, which run from the tip of the cusp mesially and distally to the mesio-linguo-occlusal and the disto-linguo-occlusal angles of the tooth. The mesial and distal marginal ridges of the occlusal surface join, respec-

tively, the occlusal marginal ridges of the buccal and lingual cusps. The occlusal surface of the lower second premolar, as shown in Fig. 59, presents seven grooves, which are named as follows: central, mesial, and distal, mesio-bucco-triangular, disto-bucco-triangular, mesio-linguo-triangular, and disto-linguo-triangular. The central groove, which is also known as the central fossa, divides the bucco-triangular ridge from the linguo-triangular ridge, and the bucco- and linguo-triangular ridges taken together form the transverse ridge of the occlusal surface. The transverse ridge of the occlusal surface of the lower second premolar is crossed by the central groove, or central fossa. The mesial and distal ends of the central groove, or fossa, terminate with the beginning of the mesial and distal grooves, which pass, respectively, mesially and distally to the mesial and distal marginal ridges. The mesio-bucco-triangular and disto-bucco-triangular grooves originate near the junction of the central fossa with the mesial and distal grooves, and pass buccally to the mesio-bucco-occlusal and disto-bucco-occlusal angles of the tooth. They separate the bucco-triangular ridge in the buccal portion from the mesial and distal marginal ridges. The disto-linguo-triangular and the mesio-linguo-triangular grooves arise at the junction of the central groove with the mesial and distal grooves, and pass, respectively, disto-lingually and mesio-lingually to the disto-linguo-occlusal angle and the mesio-linguo-oc-

clusal angle of the tooth. They separate the linguo-triangular ridge from the lingual portion of the mesial and distal marginal ridges.

Another type of the occlusal surface of the lower second premolar is shown in Fig. 60, which presents three cusps; a buccal cusp, a mesio-lingual cusp, and a disto-lingual cusp. In this type of

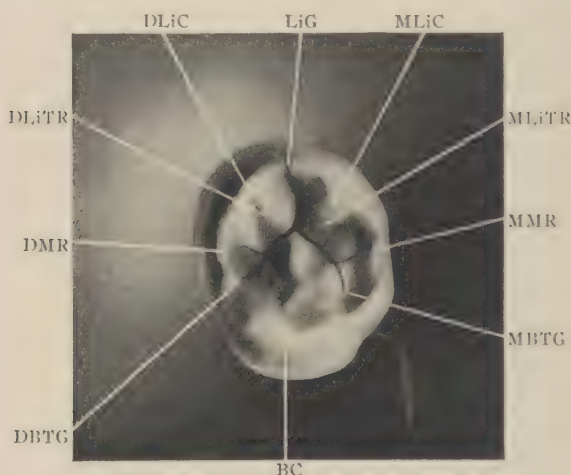


Fig. 60.—Occlusal surface of three-cusped lower second premolar. DLiTR, Disto-linguo-triangular ridge; DMR, Distal marginal ridge; DBTG, Disto-bucco-triangular groove; BC, Buccal cusp; MBTG, Mesio-bucco-triangular groove; MMR, Mesial marginal ridge; MLiTR, Mesio-linguo-triangular ridge; MLiC, Mesio-lingual cusp; LiG, Lingual groove; DLiC, Disto-lingual cusp.

lower second premolar, the lingual surface of the tooth is much wider than the buccal surface, with the result that the entire lingual surface presents a different shape than it does in the typical tooth illustrated in Fig. 59. The ridges of the buccal cusp are the same as they are in Fig. 59, but the

grooves of the occlusal surface are arranged differently. The central groove is decidedly short, and the mesial and distal grooves are not very well developed. The principal grooves consist of the central groove, the mesio-bucco-triangular and disto-bucco-triangular grooves, the mesial and distal grooves, and the lingual groove. The lingual groove passes from the central fossa lingually, and divides the lingual portion of the occlusal surface into two cusps, the mesio-lingual and disto-lingual. Each of these lingual cusps presents a triangular ridge which passes from the tip of the cusp to the central fossa of the tooth. The lingual groove passes over the linguo-occlusal margin of the tooth, and can often be followed along the lingual surface of the tooth for some distance in the direction of the gingival border of the lingual surface. Fig. 61 shows the occlusal surface of the lower second premolar, the crown of which have a tendency to be quite round with indistinct mesio-bucco-occlusal, disto-bucco-occlusal, mesio-linguo-occlusal, and disto-linguo-occlusal angles. In other words, the marginal ridges of the tooth has a tendency to form a circle without any well marked points or angles. The buccal cusp is more typically developed, presenting a well developed triangular ridge, which terminates at the central fossa. The central groove joins the triangular groove in such a manner as to make a continuous crescent-shaped groove extending from the mesio-bucco-occlusal

angle of the tooth to the disto-bucco-occlusal angle. The lingual cusp of the tooth is simply a continuation of the mesial and distal marginal ridges with the mesio-linguo-occlusal and disto-linguo-occlusal marginal ridges without any well developed

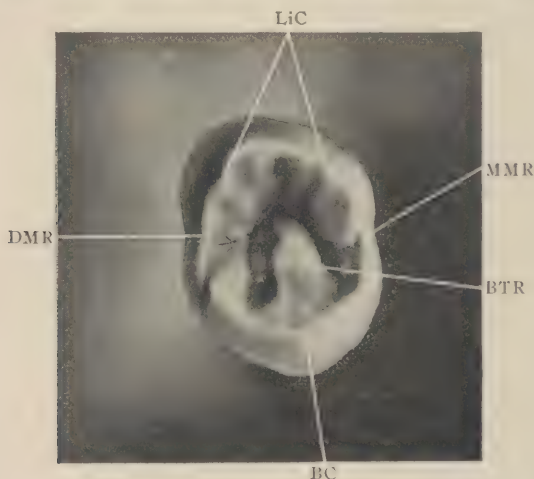


Fig. 61.—Occlusal surface of the lower second premolar with lingual cusp. DMR, Distal marginal ridge; BC, Buccal cusp; BTR, Bucco-triangular ridge; MMR, Mesial marginal ridge; LiC, Lingual cusps.

point. Therefore, in the majority of these teeth there is no well defined linguo-triangular ridge, neither are there any well developed disto-linguo- and mesio-linguo-triangular grooves. The mesial and distal grooves may extend from the arms of the crescent-shaped fossa towards the mesial and distal margins.

The Root.

The root of the lower second premolar is larger in all directions than the root of the lower first

premolar, or bicuspid, and gradually slopes from the gingival border to the apex with about an equal degree of convergence on both sides. However, in some instances, it converges more rapidly towards the apex on the buccal side than on the lingual side, as a result of which the lingual side of the root of the tooth is more of a straight line than the buccal side. The mesial and distal surfaces may be flattened or may present a concavity or a groove. In the majority of cases, the apex of the root of the lower second premolar is rather blunt, but in some cases it may taper to a long apex and be decidedly curved. Occasionally, a lower second premolar is found with the root grooves on the buccal side, with a tendency towards a division forming a buccal and lingual root.

Pulp Cavity.

The pulp canal of the lower second premolar is generally very regular in outline, especially in those cases where the root is regular in form and

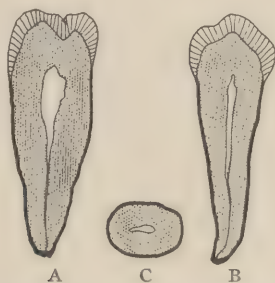


Fig. 62.—Pulp cavity of the lower second premolar. A, Bucco-lingual diameter; B, Mesio-distal diameter; C, Cross section of pulp cavity.

shape. The greatest diameter of the pulp canal is bucco-lingual in the region of the gingival portion of the tooth. It gradually tapers down towards the apex, or, in some cases, it may become quite small.

Occlusion.

The mesio-buccal inclined plane of the buccal cusp of the lower second premolar occludes with the disto-lingual inclined plane of the buccal cusp of the upper first premolar. The mesio-lingual inclined plane of the buccal cusp of the lower second premolar occludes with the disto-buccal inclined plane of the lingual cusp of the upper first premolar. The disto-buccal inclined plane of the buccal cusp of the lower second premolar occludes with the mesio-lingual inclined plane of the buccal cusp of the upper second premolar. The disto-lingual inclined plane of the buccal cusp of the lower second premolar occludes with the mesio-buccal inclined plane of the lingual cusp of the upper second premolar. The mesio-buccal inclined plane of the lingual cusp of the lower second premolar occludes with the disto-lingual inclined plane of the lingual cusp of the upper first premolar. The disto-buccal inclined plane of the lingual cusp of the lower second premolar occludes with the mesio-lingual inclined plane of the lingual cusp of the upper second premolar. The mesio-lingual and disto-lingual inclined planes of the lingual cusp of the lower second premolar have no occlusion.

CHAPTER V.

PERMANENT MOLARS.

The molar teeth are decidedly different from any of the other teeth as they are designed particularly for grinding food; consequently they have very large broad occlusal surfaces, presenting for study a number of cusps not found on any of the other teeth. These cusps are separated by a number of grooves and fossæ, and have well marked ridges which greatly increase their masticating efficiency. The molars, twelve in number, three on each side above and below, make their appearance posterior to the deciduous teeth and have no deciduous successors. They are the sixth, seventh, and eighth teeth from the median line, and are named respectively, the first, second, and third molars. The third molar above and below is often called the "wisdom tooth," and is the last one of the teeth to erupt. The upper and lower molars are shaped to occlude with each other, but the shapes of the crowns and the contours are quite different in order to present the greatest amount of occlusal surface. The upper first, second, and third molars resemble each other, as do the lower first, second, and third molars. They present points of difference, which makes it necessary for each one to be described separately, at least from a comparative standpoint.

UPPER FIRST MOLAR.

The upper first molar presents for study a crown, which is bounded by five surfaces, mesial, distal, buccal, lingual, and occlusal, and is a regular rhomboid in form, the mesio-buccal and disto-lingual angles of which are acute angles, while the mesio-lingual and disto-buccal angles are obtuse. It presents three roots, named the mesio-buccal, disto-buccal, and lingual, which we will describe separately.

Buccal Surface.

The buccal surface of the upper first molar is convex ocluso-lingivally and mesio-distally, and is bounded by four point angles and four line angles. The line angles are the mesial, occlusal, distal, and gingival. The point angles are the mesio-occlusal, disto-occlusal, mesio-lingival, and disto-lingival. The buccal surface of the upper first molar is a modified rectangle in form, the greatest diameter of which is mesio-distally. The occlusal border of the buccal surface is surmounted by the tips of two cusps, the mesio-buccal and disto-buccal, which are separated by a groove, the buccal groove, which is the termination of the buccal groove that originates in the central fossa of the occlusal surface. There are two ridges on the buccal surface running ocluso-lingivally, known as the mesio-buccal and disto-buccal ridges of the buccal surface, or the buccal ridges of the mesio-buccal and disto-buccal cusps.

The gingival line angle is very nearly straight or may be convex, with the convexity towards the root. The mesial and distal margins of the buccal surface converge towards the center of the

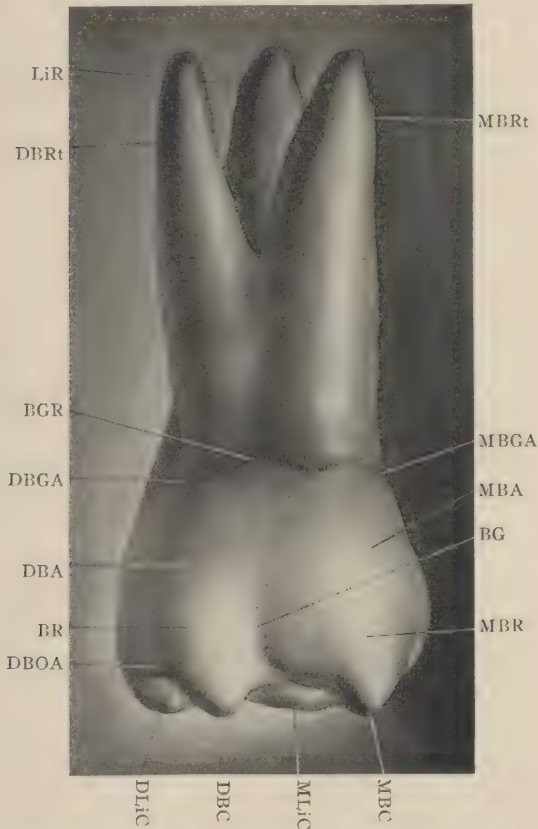


Fig. 63.—Buccal surface of the upper right first molar. LiR, Lingual root; DBRt, Disto-buccal root; BGR, Bucco-lingual ridge; DBGA, Disto-bucco-lingual angle; DBA, Disto-buccal angle; BR, Buccal ridge; DBOA, Disto-bucco-occlusal angle; DLiC, Disto-lingual cusp; DBC, Disto-buccal cusp; MLiC, Mesio-lingual cusp; MBC, Mesio-buccal cusp; MBR, Mesio-buccal ridge; BG, Buccal groove; MBA, Mesio-buccal angle; MBGA, Mesio-bucco-lingual angle; MBRt, Mesio-buccal root.

tooth in such a manner as to make the gingival margin much shorter than the occlusal. The mesial portion of the buccal surface joins the mesial surface of the tooth at an acute angle, while the distal portion of the buccal surface joins the distal surface of the tooth at an obtuse angle. The buccal surface is slightly convex occluso-gingivally, with the greatest amount of convexity about the center of the surface. The gingival ridge is more prominent in the mesio-buccal than in the disto-buccal portion.

Lingual Surface.

The lingual surface of the upper first molar presents the same line angles and point angles as the buccal surface. The greatest diameter of the lingual surface is mesio-distally, and is slightly convex in all directions. The lingual surface is divided by the lingual groove into two ridges, which are known as the lingual ridges of the mesio-lingual and disto-lingual cusps. The gingival border of the lingual surface is very nearly straight, or may be convex, with the convexity towards the root. Near the gingival surface we may find a concavity which extends on the lingual surface of the lingual root. The occlusal margin of the lingual surface is developed into two prominent cusps or points, which are known as the mesio-lingual and disto-lingual cusps, the mesio-lingual being much larger than the disto-lingual. The distal line angle of the lingual surface joins the distal surface of the tooth at an acute angle.

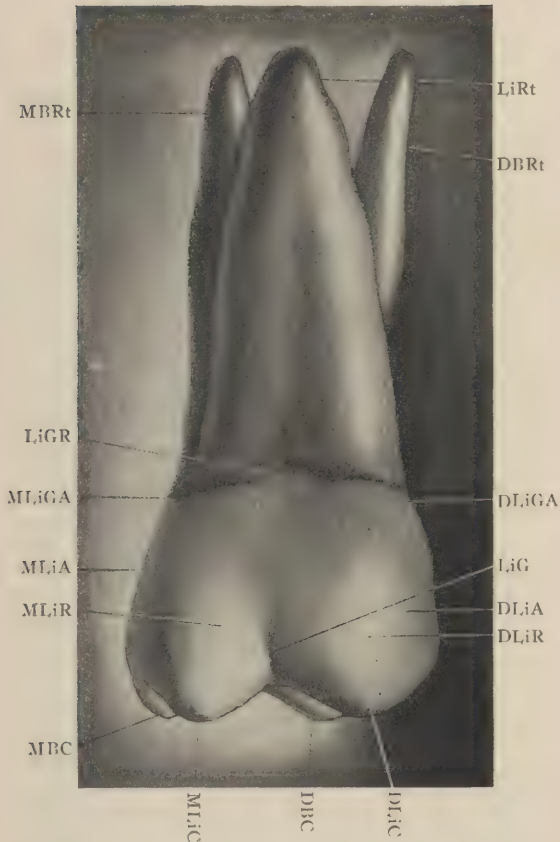


Fig. 64.—Lingual surface of the upper right first permanent molar. MBRt, Mesio-buccal root; LiGR, Linguo-gingival ridge; MLiGA, Mesio-linguo-gingival angle; MLiA, Mesio-lingual angle; MLiR, Mesio-lingual ridge; MBC, Mesio-buccal cusp; MLiC, Mesio-lingual cusp; DBC, Disto-buccal cusp; DLiC, Disto-lingual cusp; DLiR, Disto-lingual ridge; DLiA, Disto-lingual angle; LiG, Lingual groove; DLiGA, Disto-linguo-gingival angle; DBRt, Disto-buccal root; LiRt, Lingual root.

while the mesial line angle of the lingual surface joins the mesial surface of the tooth at an obtuse angle.

Mesial Surface.

The mesial surface of the upper first molar is bounded by four point angles and four line an-

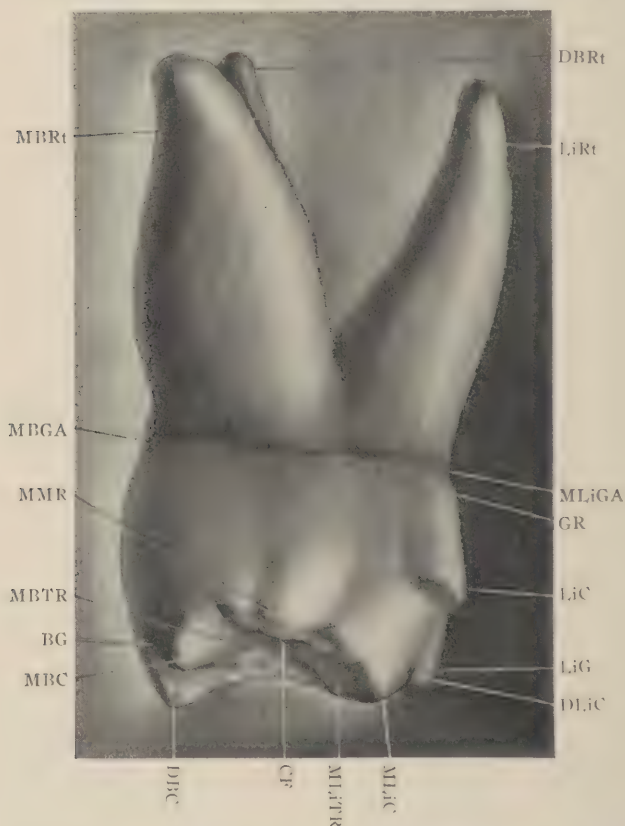


Fig. 65.—Mesial surface of the upper right first molar. MBRT, Mesio-buccal root; MBGA, Mesio-bucco-lingual angle; MMR, Mesial marginal ridge; MBTR, Mesio-bucco-triangular ridge; BG, Buccal groove; MBC, Mesio-buccal cusp; DBC, Disto-buccal cusp; CF, Central fossa; MLiTR, Mesio-linguo-triangular ridge; MLiC, Mesio lingual cusp; DLiC, Disto-lingual cusp; LiG, Lingual groove; LiC, Lingual or fifth cusp; GR, Gingival ridge; MLiGA, Mesio-linguo-lingual angle; LiRT, Lingual root; DBRT, Disto-buccal root.

gles, the line angles being the occlusal, buccal, gingival, and lingual. The point angles are the bucco-occlusal, bucco-lingual, linguo-lingual, and linguo-occlusal. The surface is slightly convex occluso-lingually and also bucco-lingually, but has a greater tendency towards the formation of a flat surface than any of the other surfaces of the upper first molar. There may be a concavity on the mesial surface near the gingival third. The mesial surface joins the occlusal surface in such a manner as to form a sharp angle, and the bucco-occlusal and linguo-occlusal point angles are well defined. The gingival angles are more round, and the gingival border of the mesial surface is slightly convex, with the convexity towards the crown.

Distal Surface.

The distal surface of the upper first molar is bounded by the same point angles and line angles as the mesial surface. The distal surface is convex bucco-lingually and occluso-lingually, with the greatest amount of convexity on the lingual surface, and the surface gradually converges towards the buccal, where it joins the buccal surface at an obtuse angle. In cases where the disto-lingual lobe of the distal surface is well developed, may be found a concavity at the bucco-lingual portion of the distal surface. The distal surface is divided by the distal groove which crosses the distal marginal ridge from the disto-lingual fossa. The distal groove may be continued across

the gingival surface to the junction between the distal and lingual root. The junction between the lingual and distal surfaces is more of a right an-

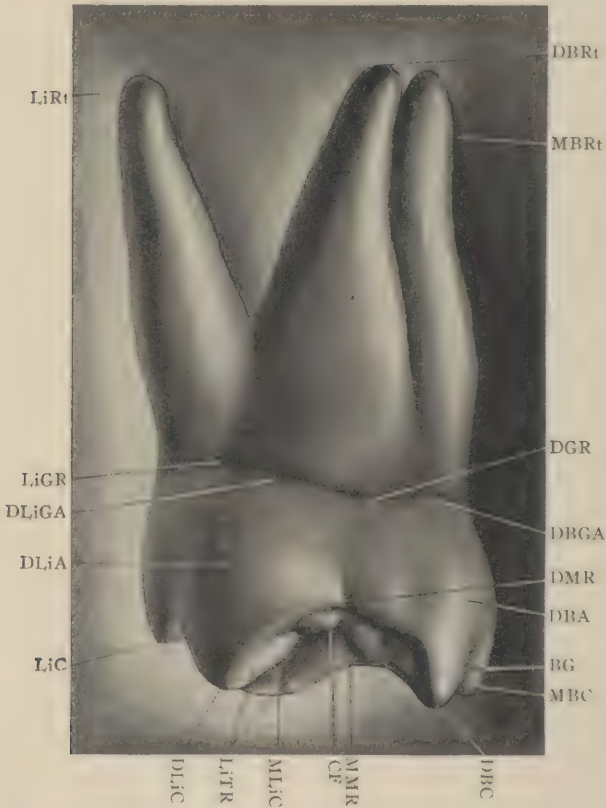


Fig. 66.—Distal surface of the upper right first molar. LiRt, Lingual root; LiGR, Linguo-lingual ridge; DLiGA, Disto-linguo-lingual angle; DLiA, Disto-lingual angle; LiC, Lingual or fifth cusp; DLiC, Disto-lingual cusp; LiTR, Linguo-triangular ridges; MLiC, Mesio-lingual cusp; CF, Central fossa; MMR, Mesial marginal ridge; DBC, Disto-buccal cusp; MBC, Mesio-buccal cusp; BG, Buccal groove; DBA, Disto-buccal angle; DMR, Disto-marginal ridge; DBGA, Disto-bucco-lingual angle; DGR, Disto-lingual ridge; MBRt, Mesio-buccal root; DBRt, Disto-buccal root.

gle than the junction between the distal and buccal surfaces.

Occlusal Surface.

The occlusal surface of the upper first molar presents four line angles and four point angles; four cusps with their occlusal and triangular ridges; a central fossa with the mesial, buccal, and distal grooves; a disto-lingual fossa with the distal and lingual grooves. The occlusal surface, when viewed in a line with the long axis of the tooth, presents a rhomboidic form, the mesio-buccal and disto-lingual angles being acute angles and the mesio-lingual and disto-buccal angles obtuse.

The mesio-buccal cusp is located at the mesio-buccal angle of the occlusal surface, and is divided from the rest of the tooth by the buccal and the mesio-buccal triangular grooves. The ridges of the buccal cusp are the buccal ridge, which passes from the tip of the buccal cusp gingivally; the mesio-occlusal marginal ridge, which passes from the tip of the cusp mesially; the disto-bucco-occlusal marginal ridge, which passes from the tip of the cusp distally to the buccal groove; and the triangular ridge, which passes lingually from the tip of the cusp towards the central fossa. The buccal ridge divides the buccal surface of the buccal cusp into the mesio-buccal and disto-buccal inclined planes. The triangular ridge divides the lingual surface into the mesio-linguo- and disto-linguo-occlusal inclined planes.

The disto-buccal cusp is smaller in all directions than the mesio-buccal cusp, and presents for study the same ridges. It is divided from the remaining portion of the occlusal surface by the buccal groove, which separates it from the mesio-buccal cusp, and the bucco-triangular groove, which separates it from the distal portion of the tooth. The triangular ridge of the disto-buccal cusp passes from the tip of the cusp lingually towards the central fossa, and is separated from the mesio-lingual cusp by the distal groove, which is the distal termination of the central fossa.

The mesio-lingual cusp is the largest of the cusps, and presents a well developed triangular ridge which is larger than either of the triangular ridges of the disto-buccal or mesio-buccal cusps. The mesio-lingual cusp is separated from the other cusps by the mesio-linguo-triangular groove, the central fossa and the distal groove, and the disto-lingual fossa and lingual groove. The tendency of the mesio-lingual cusp is to be more pyramidal in shape, bounded by four sides, than any of the other cusps. The mesio-linguo- and disto-linguo-occlusal borders of the mesio-lingual cusp join each other so as to be more crescent-shaped than the occlusal border of the mesio-buccal or disto-buccal cusps. The mesio-lingual angle of the mesio-lingual cusp in the majority of first molars develops a fifth cusp, or the mesio-lingual cusp (Fig. 65). The triangular ridge of the mesio-lingual cusp joins the triangular ridge of the mesio-

buccal cusp and forms the mesial transverse ridge of the upper first molar. Owing to the fact that the triangular ridge of the mesio-lingual cusp is a flat, broad ridge, the distal portion also joins the triangular ridge of the disto-buccal cusp.

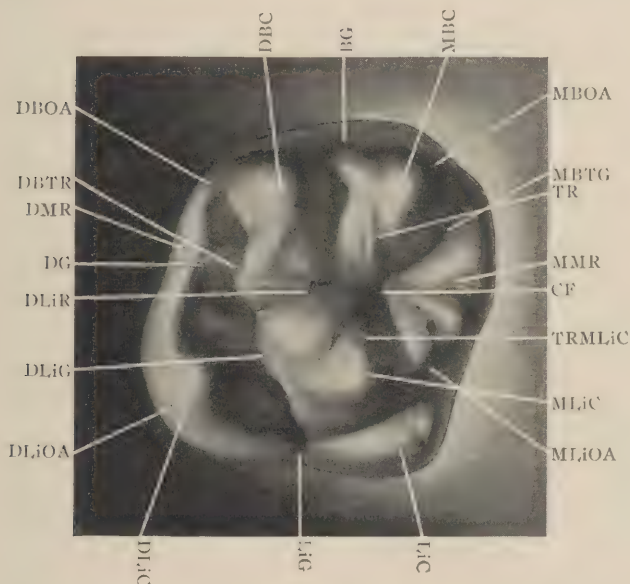


Fig. 67.—Occlusal surface of the upper right first molar. DBOA, Disto-bucco-occlusal angle; DBTR, Disto-bucco-triangular ridge; DMR, Distal marginal ridge; DG, Distal groove; DLiR, Disto-lingual ridge; DLiG, Disto-lingual groove; DLiOA, Disto-linguo-occlusal angle; DLiC, Disto-lingual cusp; LiG, Lingual groove; LiC, Lingual or fifth cusp; MLiOA, Mesio-linguo-occlusal angle; MLiC, Mesio-lingual cusp; TRMLiC, Triangular ridge of mesio-lingual cusp; CF, Central fossa; MMR, Mesio-lingual ridge; TR, Triangular ridge; MBTG, Mesio-bucco-triangular groove; MBOA, Mesio-bucco-occlusal angle; MBC, Mesio-buccal cusp; BG, Buccal groove; DBC, Disto-buccal cusp.

In fact, the three cusps of the upper first molar, the mesio-lingual, mesio-buccal, and disto-buccal, have a tendency to form a triangle and the ridges

are so formed as to give evidence of the first molar having evolved from a three-cusped tooth.

The disto-lingual cusp, which is the smallest of the four cusps, is separated from the other three cusps by the disto-lingual fossa and the distal groove of the disto-lingual fossa, and the lingual groove. The disto-lingual cusp presents the mesio-occlusal border, which runs from the tip of the cusp mesially to the lingual groove; the disto-occlusal border, which runs distally and turns towards the buccal in a crescent-shaped portion and joins the distal marginal ridge of the occlusal surface in a well formed crescentic ridge. The distal marginal ridge of the occlusal surface extends from the disto-buccal angle of the occlusal surface to the disto-lingual angle, and is crossed by the distal groove, which arises in the disto-lingual fossa, and passes gingivally, separating the disto-lingual cusp from the disto-buccal angle of the tooth. The lingual groove is the mesio-lingual termination of the disto-lingual fossa, and crosses the lingual margin of the occlusal surface at a point distal to the center. The mesio-marginal ridge of the occlusal surface at the mesio-buccal angle of the occlusal surface joins the occlusal ridge of the buccal surface at an acute angle, and converges towards the mesio-lingual cusp, which it joins at an obtuse angle. The mesial marginal ridge is crossed near the center by the mesial groove, which originates in the central fossa and passes over the mesial margin of

the tooth gingivally across the mesial surface. The buccal portion of the mesial marginal ridge is separated from the occlusal surface by the mesio-bucco-triangular groove. The lingual portion of the mesial marginal ridge is separated from the mesio-lingual cusp by the mesio-linguo-triangular groove, which runs from the central fossa near the junction of the central fossa with the mesio-bucco-triangular groove lingually to the mesio-lingual angle. The central fossa of the tooth extends from the junction of the triangular ridge of the disto-buccal cusp with the triangular ridge of the mesio-lingual cusp to the termination, or beginning, of the mesio-bucco- and mesio-linguo-triangular groove. The central fossa of an upper first molar is quite short. One may often see only a well developed fossa taking up but a small amount of the occlusal surface. There is a groove running distally from the central fossa, which separates the triangular ridge of the disto-buccal cusp from the triangular ridge of the mesio-lingual cusp, and which terminates in the disto-lingual fossa. This groove is known as the distal groove of the central fossa, and is to be distinguished from the distal groove, which originates in the disto-lingual fossa and crosses the distal marginal ridge and passes gingivally over the distal surface. It is absolutely essential that the student become familiar with these different grooves and ridges of the upper first molars, for they differ materially from the grooves and ridges of the lower first molars or from the premolars.

The Root.

The root of the upper first molar is divided into three prongs, or fangs, known as the mesio-buccal, disto-buccal, and lingual, of which the lingual root is the largest. The mesial root possesses a large diameter bucco-lingually, and is quite narrow mesio-distally. It is therefore said to be flattened on the mesial and distal sides. The mesial and distal sides converge towards the lingual, so that the lingual portion of the root is thinner than the buccal portion. The mesial fang may terminate into a round apex, or may be curved towards the distal. The distal fang is the smallest fang of the root of the upper first molar. It is more nearly round, but has a tendency to be flattened on the mesial and distal sides. This fang, as a rule, is shorter and is generally curved towards the mesial fang. The lingual fang, or root, of the upper first molar is larger than the other two and in the gingival portion converges towards the lingual, and may so continue towards the apex, or it may be turned towards the center of the axis of the tooth. In that case, it presents a lingual surface, with a decided convexity towards the lingual. The greatest diameter of the lingual root is mesio-distally and the mesial and distal sides gradually converge towards the apex, terminating in a round, or blunt, apex. The lingual side of the lingual root is generally convex in the middle third, while the buccal side is concave. The gingival portion of the buccal surface

of the lingual root may be extended in such a manner as to set between the mesio-buccal and disto-buccal fangs, or roots. The lingual surface of the lingual root is generally grooved from the gingival border to about two-thirds of the way towards the apex.

Pulp Cavity.

The pulp canal of the upper first molar follows the same outline as the fangs of the root. In the

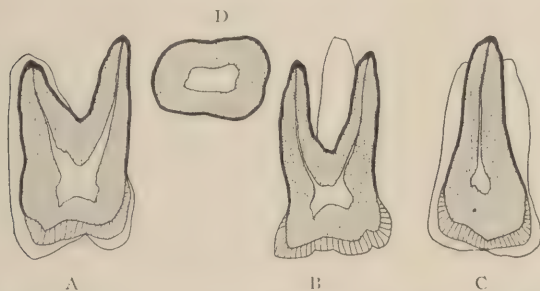


Fig. 68. -Pulp cavity of the upper right first molar. A, Distal and lingual roots; B, Mesial and distal roots; C, Lingual root; D, Cross section of pulp cavity at gingival portion.

coronal portion of the tooth are four projections, which project towards each one of the four cusps. Of these projections, the mesio-lingual and the mesio-buccal are usually better developed than the disto-buccal and disto-lingual. The pulp canal of the lingual root is the largest, while the pulp canal of the disto-buccal root is the smallest. Owing to the fact that the disto-buccal root has a tendency to be curved, a great deal of difficulty is often encountered in opening into the pulp

canal of that root. The pulp canal of the lingual root of the upper first molar, instead of being a single canal may be bifurcated or narrowed bucco-lingually so as to cause considerable difficulty in cleaning it out. The pulp canal may terminate at the apex in a single opening, or there may be several foramina and bifurcations, which adds to the difficulty in treating the pulp canals of this tooth.

Occlusion.

The mesio-buccal inclined planes of the mesio-buccal and disto-buccal cusps have no occlusion. The mesio-lingual inclined plane of the mesio-buccal cusp of the upper first molar occludes with the disto-buccal inclined plane of the mesio-buccal cusp of the lower first molar. The disto-lingual inclined plane of the mesio-buccal cusp of the upper first molar occludes with the mesio-buccal inclined plane of the disto-buccal cusp of the lower first molar. The mesio-lingual cusp of the upper first molar falls in the central fossa of the lower first molar and is therefore surrounded by all of the cusps of the lower first molar. The mesio-buccal inclined plane of the mesio-lingual cusp of the upper first molar occludes with the disto-lingual plane of the mesio-buccal cusp of the lower first molar. The mesio-lingual inclined plane of the mesio-lingual cusp of the upper first molar occludes with the disto-buccal inclined plane of the mesio-lingual cusp of the lower first molar. The disto-buccal inclined plane of the mesio-lingual

gual cusp of the upper first molar occludes with the mesio-lingual inclined plane of the disto-buccal cusp of the lower first molar. The disto-lingual inclined plane of the mesio-lingual cusp of the upper first molar occludes with the mesio-buccal inclined plane of the disto-lingual cusp of the lower first molar. The mesio-lingual inclined plane of the disto-buccal cusp of the upper first molar occludes with the disto-buccal inclined plane of the disto-buccal cusp of the lower first molar. The disto-lingual inclined plane of the disto-buccal cusp of the upper first molar occludes with the mesio-buccal inclined plane of the mesio-buccal cusp of the lower second molar. The mesio-buccal inclined plane of the disto-lingual cusp of the upper first molar occludes with the disto-lingual inclined plane of the disto-buccal cusp of the lower first molar. The mesio-lingual inclined plane of the disto-lingual cusp of the upper first molar occludes with the disto-buccal inclined plane of the disto-lingual cusp of the lower first molar. The disto-buccal inclined plane of the disto-lingual cusp of the upper first molar occludes with the mesio-lingual inclined plane of the mesio-buccal cusp of the lower second molar. The disto-lingual inclined plane of the disto-lingual cusp of the upper first molar occludes with the mesio-buccal inclined plane of the mesio-lingual cusp of the lower second molar. The lingual or fifth cusp which develops on the mesio-lingual cusp has no occlusion.

Practical Consideration.

Because of its size the upper first molar is the most important tooth in the upper arch from the standpoint of mastication. The grooves and ridges of the occlusal surface are so shaped as to give the greatest masticating efficiency, and the gingival margins and convexities of the buccal, lingual, mesial and distal surfaces are so arranged as to protect the gingival gum tissue. Owing to the fact that the central fossa of the upper first molar is generally so deep that it may be fissured, great care must be taken in watching that point of the tooth for cavities. Cavities are prone to develop at the termination of the buccal groove on the buccal surface and also in the disto-lingual fossa of the occlusal surface. Cavities which involve the mesial and distal surfaces must have their fillings properly contoured, and the marginal ridges and grooves should be reproduced in order to give the proper masticating efficiency and to prevent the food from crowding between the teeth. On account of the great amount of convexity of the disto-lingual angle of the distal surface, it is quite convenient for a cavity to develop at the buccal portion of the distal surface. This surface is very difficult to properly fill and restore either by a filling or inlay or by the construction of a crown. When constructing crowns, it must be remembered that the neck of the tooth is much smaller in diameter than the proximate contact, and therefore great care must be ob-

served in having the gingival portion of the crown small enough to fit the neck of the root, and the occlusal portion contoured so as to give the proper efficiency and protection to the gum tissue. Due to the fact that the tooth has erupted very early, decay may progress to considerable extent before discovery, and it must be remembered that the apexes of the roots are not fully developed until several years after the crown has fully emerged from the gum.

LOWER FIRST MOLAR.

The lower first molar is generally the largest of the lower molar series, and is located distally to the lower second premolar and mesially to the lower second molar. It occludes with the upper first molar and the upper second premolar. The crown presents five surfaces, the occlusal, mesial, distal, buccal, and lingual. The root, as a rule, is divided into two fangs, the mesial and distal, the mesial fang of which may be bifurcated into a buccal and lingual fang.

Buccal Surface.

The buccal surface of the lower first molar is irregular or trapezoidal in form, the longest line angle being the occlusal, and the shortest the mesial and distal line angles. The mesial and distal line angles of the buccal surface converge towards the gingival with about equal degrees of convergence, and are about equally convex. The

buccal surface of the lower first molar is surmounted by three cusps, the mesio-buccal, disto-buccal, and distal. The buccal surface is crossed by two grooves, the buccal and disto-buccal. The

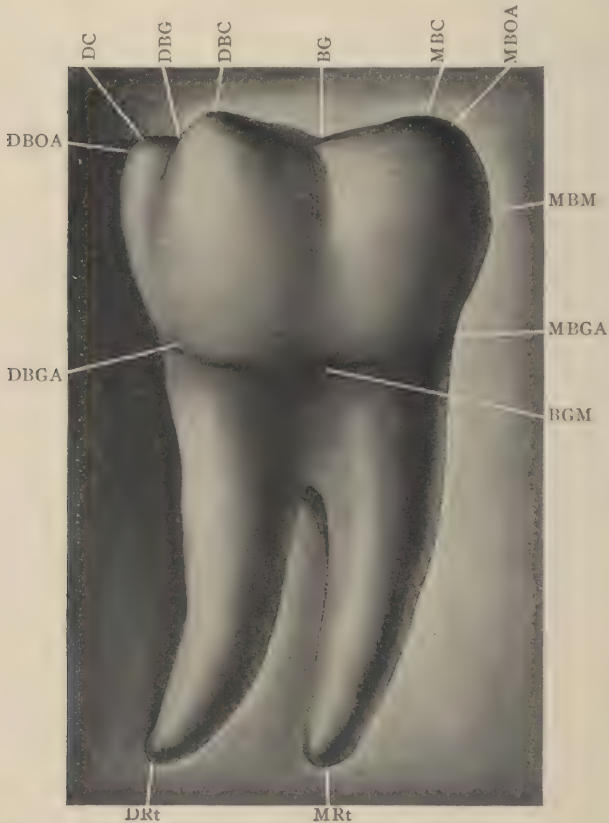


Fig. 69.—Buccal surface of the lower right first molar. DBOA, Disto-bucco-occlusal angle; DBGA, Disto-bucco-gingival angle; DRt, Distal root; MRt, Mesial root; BGM, Bucco-gingival margin; MBGA, Mesio-bucco-gingival angle; MBM, Mesio-buccal margin; MBOA, Mesio-bucco-occlusal angle; MBC, Mesio-buccal cusp; BG, Buccal groove; DBC, Disto-buccal cusp; DBG, Disto-buccal groove; DC, Distal cusp.

gingival line is straight, or may be slightly convex with the convexity towards the root. The occlusal line angle is in all probability about two-sevenths longer than the gingival line angle. The buccal groove crosses the occlusal margin a little to the mesial of the mesio-distal center of the tooth and separates the mesio-buccal from the disto-buccal cusp. The disto-buccal groove crosses the distal margin of the occlusal surface near the disto-buccal angle of the tooth and separates the distal from the disto-buccal cusp. Occasionally the buccal groove continues gingivally across the buccal surface and crosses the gingival marginal ridge to the bifurcation of the mesial and distal fang of the root. The buccal surface is crossed or thrown into three ridges by the two grooves, which are the buccal ridges of the mesio-buccal, disto-buccal, and distal cusps.

Lingual Surface.

The lingual surface of the lower first molar is not as large as the buccal surface especially in the mesio-distal diameter. The surface is convex in all directions with the greatest amount of convexity near the occlusal third. The lingual surface joins the occlusal surface in such a manner as to form a well marked linguo-occlusal angle, and gradually converges towards the center of the tooth gingivally. The occlusal portion of the lingual surface is crossed by the lingual groove which arises in the central fossa and passes over

the occlusal margin, separating the mesio-lingual from the disto-lingual cusp. The lingual groove may terminate about the occlusal third of the lin-

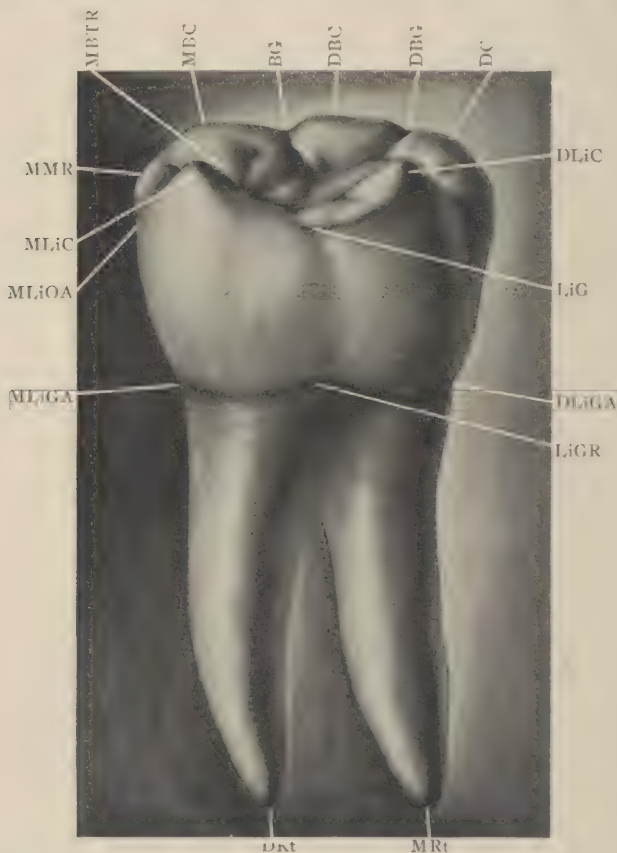


Fig. 70.—Lingual surface of the lower right first molar. MMR, Mesial marginal ridge; MLiC, Mesio-lingual cusp; MLiOA, Mesio-linguo-occlusal angle; MLiGA, Mesio-linguo-gingival angle; DRt, Distal root; MRt, Mesial root; LiGR, Linguo-gingival ridge; DLiGA, Disto-linguo-gingival angle; LiG, Lingual groove; DLiC, Disto-lingual cusp; DC, Distal cusp; DBG, Disto-buccal groove; DBC, Disto-buccal cusp; BG, Buccal groove; MBC, Mesio-buccal cusp; MBTR, Mesio-bucco-triangular ridge.

gual surface in a small pit, or gradually become obliterated, or it may pass gingivally across the lingual side to the bifurcation of the root. The gingival marginal ridge of the lingual surface is generally convex, with the convexity towards the root.

Mesial Surface.

The mesial surface of the lower first molar (Fig. 71) presents four line angles, the occlusal, buccal, lingual, and distal, and four point angles, the bucco-occlusal, bucco-gingival, linguo-gingival, and linguo-occlusal. The surface is generally convex in all directions, with the greatest convexity near the bucco-occlusal portion. The buccal and lingual line angles are convex, with the greatest convexity of the buccal angle near the gingival portion, and the greatest convexity of the lingual angle near the occlusal portion. The gingival line angle is convex, with the convexity towards the crown, or it may be more nearly a straight line.

Fig. 71 is a view of the lower first molar, slightly tipped to show the mesial portion and the grooves running from the central portion of the tooth across the occlusal border. The occlusal line angle is generally concave and crossed by one or two grooves. The mesial groove, which always originates in the central fossa and passes mesially across the border of the tooth, and also the bucco-triangular groove, which separates the mesio-

buccal cusp from the mesial marginal ridge, can be followed across the tooth as shown in Fig. 71. Near the gingival portion of the mesial surface we may find a slight concavity, especially in the

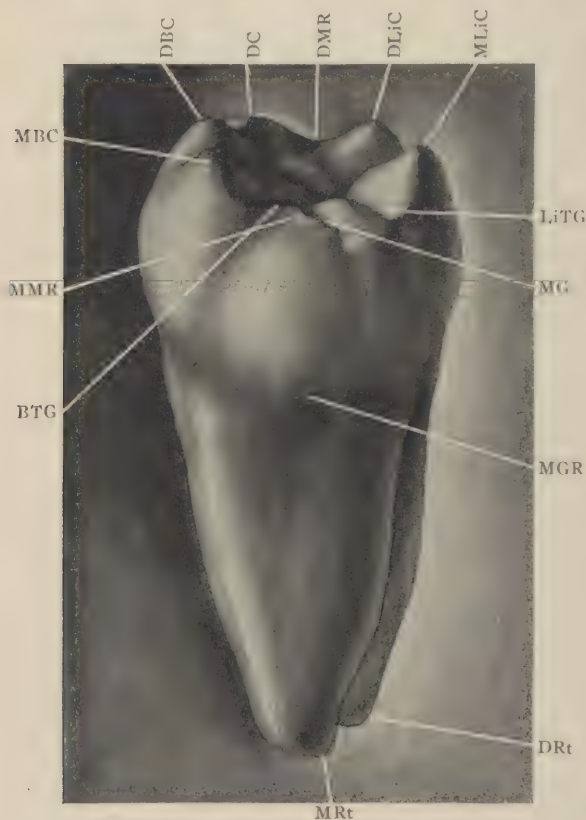


Fig. 71.—Mesial surface of the lower right first molar. The tooth is slightly tipped to show occlusal surface. MBC, Mesio-buccal cusp; MMR, Mesial marginal ridge; BTG, Bucco-triangular groove; MRt, Mesial root; DRt, Distal root; MGR, Mesio-lingual groove; MG, Mesial groove; LiTG, Linguo-triangular groove; MLiC, Mesio-lingual cusp; DLiC, Distal-lingual cusp; DMR, Distal-marginal ridge; DC, Distal cusp; DBC, Distal-buccal cusp.

bucco-lingual direction. The occlusal portion of the mesial surface is made up of the mesial marginal ridge. Between the bucco-triangular ridge and the central groove is a well marked angle, which gradually rounds off towards the mesio-buccal and mesio-lingual cusps.

Distal Surface.

The distal surface of the lower first molar is bounded by the same line angles and point angles as the mesial surface, and is convex buccolingually and occluso-lingivally. However, in the occluso-lingival direction there is a tendency for the formation of a concavity near the gingival portion. The occlusal marginal ridge, or line angle of the distal surface, is always crossed by the distal groove. It may also be crossed by the disto-bucco-triangular and disto-linguo-triangular grooves which separate the distal cusp and the disto-lingual cusp from the marginal ridge.

Occlusal Surface.

The occlusal surface of the lower first molar differs very materially from that of any of the other first molars, or any of the other molar teeth, owing to that fact that it is a typical five-cusped tooth, surmounted by the mesio-buccal, disto-buccal, distal, mesio-lingual, and disto-lingual cusps. Separating these cusps, we find the central fossa, the mesial and distal grooves which originate respectively at the mesial and distal borders of the

central fossa, the mesio-bucco-triangular groove, the mesio-linguo-triangular groove, the lingual groove, the buccal groove, the disto-buccal groove, the disto-linguo-triangular groove, and the disto-

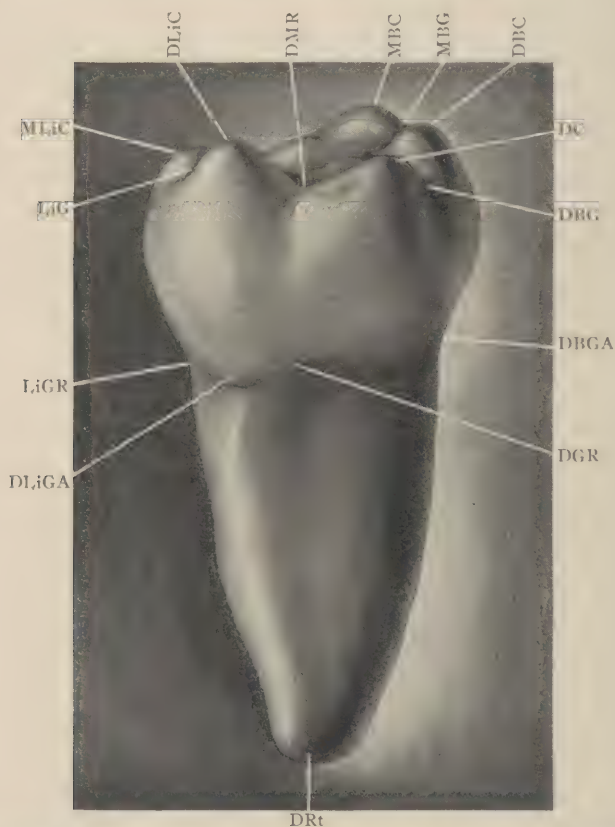


Fig. 72.—Distal surface of the lower right first molar. MLiC, Mesio-lingual cusp; LiG, Lingual groove; LiGR, Linguo-gingival ridge; DLiGA, Disto-linguo-gingival angle; DRt, Distal root; DGR, Disto-gingival ridge; DBGA, Disto-bucco-gingival angle; DBG, Disto-buccal groove; DC, Distal cusp; DBC, Disto-buccal cusp; MBG, Mesio-buccal groove; MBC, Mesio-buccal cusp; DMR, Disto-marginal ridge; DLiC, Disto-lingual cusp.

bucco-triangular groove. These grooves are all very clearly shown in Fig. 73, with the exception of the disto-lingual and mesio-lingual grooves, which very often are not as well marked as the other grooves.

Of the ridges of the occlusal surface, we have the triangular ridge of the mesio-buccal cusp, the triangular ridge of the mesio-lingual cusp, the triangular ridge of the disto-buccal cusp, the triangular ridge of the disto-lingual cusp, and the small triangular ridge of the distal cusp, all of which slope towards the central fossa of the tooth. We also have the mesial and distal marginal ridges, which form the occlusal portion of the mesial and distal surfaces. Each one of the three buccal cusps has a buccal ridge which runs from the summit of the cusp gingivally. Each of the two lingual cusps has also a lingual ridge which runs from the summit of the cusp lingually. The lingual ridges are, of course, separated by the lingual groove, while the buccal ridges are separated from each other by the buccal and disto-buccal grooves. Each one of the cusps also presents a mesio-occlusal and disto-occlusal marginal ridge, which runs from the summit of the cusp mesially and distally towards the groove which separates it from the other cusps. All of the grooves of the lower first molar originate in the central fossa, and pass in their respective directions. The triangular ridge of the mesio-buccal cusp joins the triangular ridge of the mesio-lingual cusp and forms

the mesial transverse ridge of the occlusal surface. The triangular ridge of the disto-buccal cusp is the longest of the ridges, extending far into the lingual groove and separating or projecting in between the triangular ridges of the mesio-lingual and disto-lingual cusps. As a result of

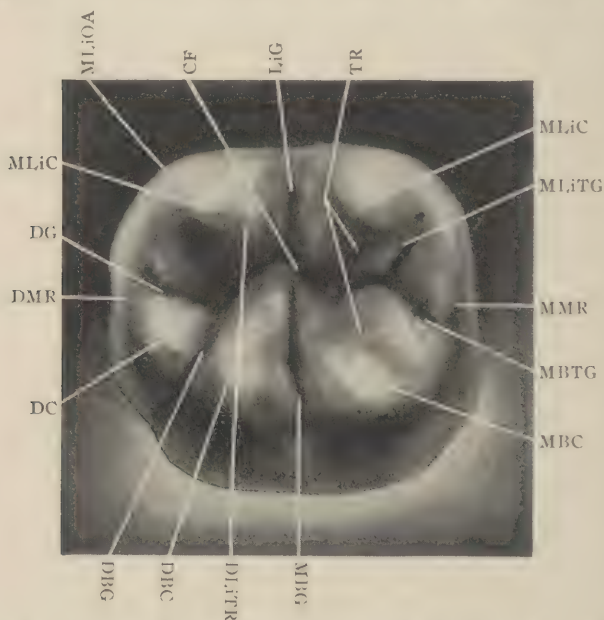


Fig. 73.—Occlusal surface of the lower right first molar. MLiC, Mesio-lingual cusp; DG, Distal groove; DMR, Distal marginal ridge; DC, Distal cusp; DBG, Disto-buccal groove; DBC, Disto-buccal cusp; DLiTR, Disto-linguo-triangular ridge; MBG, Mesio-buccal groove; MBC, Mesio-buccal cusp; MBTG, Mesio-bucco-triangular groove; MMR, Mesial marginal ridge; MLiTG, Mesio-linguo-triangular groove; MLiC, Mesio-lingual cusp; TR, Triangular ridges of mesio-buccal and mesio-lingual cusps; LiG, Lingual groove; CF, Central fossa; MLiOA, Mesio-linguo-occlusal angle.

this, the central fossa of the lower first molar is of a decided “W” shape, made so by the junction of the mesial and distal grooves with the central

fossa and the arrangement of the triangular ridge of the disto-buccal cusp. The triangular ridges of the mesio-lingual and disto-lingual cusps are the shortest of any of the cusps, with the exception of the distal cusp which is the smallest. The triangular ridge of the distal cusp is separated from other ridges by the disto-buccal and distal grooves. The mesio-buccal cusp of the lower first molar is the largest and strongest of the buccal cusps, and occupies about one-third of the occlusal surface of the lower first molar. The lingual cusps are about equal in size; if there is any difference, the disto-lingual cusp is generally the largest. The tip of a lingual cusp is situated much nearer the lingual border than the tip of a buccal cusp is near the buccal border. In other words, the tip of a buccal cusp is brought nearer the central axis of the tooth than the tip of a lingual cusp. The distal cusp is the smallest of all and occupies the disto-buccal portion of the occlusal surface, being separated from the rest of the cusps by the disto-buccal and distal grooves. In molars where the four principal cusps are poorly developed, the distal cusp will also be poorly developed.

The Root.

The root of the lower first molar is often spoken of as the mesial and distal root because it is divided into two fangs. The root is divided close to the crown, and consequently both fangs are of considerable length. The mesial root is

convex on the mesial portion, being turned towards the mesial, then gradually towards the distal. It is wide bucco-lingually and narrow mesio-distally, and is very often grooved on both the mesial and distal surfaces. This groove on the mesial and distal surfaces may be of such prominence as to divide the mesial root into two fangs, but in the majority of cases the root ends in a well-rounded apex, which may possess one or more apical openings. The distal root is generally concave on the distal side, which causes it to be almost straight in the gingival portion, and then it may converge towards the distal. In some teeth just the reverse is true. We find that the distal root inclines first towards the distal and the apex points towards the mesial, so that the apex of the mesial and distal root have a tendency to point towards each other, forming a decided space between them and the central portion.

Pulp Cavity.

The pulp cavity in the coronal portion of the tooth follows the same general outline as the crown of the tooth. The projections of the pulp on the coronal portion correspond with the cusps and the widest portion of the pulp cavity is about the region of the gingival marginal ridge. The pulp canal of the mesial root (Fig. 74) is generally divided into the buccal and lingual portions, or it may be one pulp cavity, the greatest diameter of which is in the bucco-lingual direction.

The pulp cavity in the distal root is generally one well developed cavity, as a rule of a larger size than the pulp cavity of the mesial root. In teeth where the roots are curved, the pulp cavity may present complications in the way of curvatures,

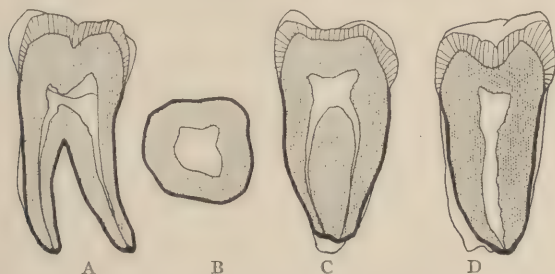


Fig. 74.—Pulp cavity of the lower right first molar. A, Mesio-distal section of mesial and distal roots; B, Cross section of pulp cavity near gingival diameter; C, Bucco-lingual section of mesial root; D, Bucco-lingual section of distal root.

or they may be several foramina opening into the region of the apex, or there may be calcified portions separating the cavities into several parts in either of the roots.

Practical Consideration.

There is a tendency for the formation of fissures and pits in different parts of the central fossa, and especially is this true in the case of pits in the central portion of the central fossa and at the junction of the mesial and distal grooves. A fissure in the enamel that is very liable to decay will often be found at the gingival portion of the buccal groove on the buccal surface of the tooth. In cavities involving the mesial or distal surface,

we must not lose sight of the fact that the mesial and distal marginal ridges with their grooves must be restored in fillings and inlays, and that the mesio-bucco-occlusal and disto-bucco-occlusal angles of the crown are acute angles, while the disto-linguo-occlusal and mesio-linguo-occlusal angles are obtuse. The contact points on the mesial and distal sides must be maintained in order to protect the proximal gum tissue and preserve the proper occlusion of the upper teeth. The buccal surface of the lower first molar is decidedly convex, with the greatest amount of convexity in the gingival portion, and the buccal cusps rest nearer the center of the occlusal surface than the lingual cusps.

On the lingual surface of the tooth, there is a decided convexity near the occlusal portion and therefore in making a crown for the lower first molar the concavities on the buccal and lingual sides must be restored and maintained in order that the food may be diverted beyond the gingival gum tissue, thereby avoiding injury to the soft structure. The operator should be very careful in opening into the pulp canal, especially in the mesial root, that both the buccal and lingual openings are entered and thoroughly cleansed. An abscess is more liable to develop on the mesial root of the lower first molar than on the distal root as the result of improper treatment owing to the small size of the canals on the distal root. In

some instances the distal root is bifurcated or divided as is the mesial root.

Occlusion.

In describing the occlusion of the lower first molar, it must be remembered that we have a five-cusped tooth, and all of these five cusps have occlusion. However, in giving the occlusion of this tooth, we consider the disto-buccal and distal cusp as one cusp. From a purely anatomical standpoint, the distal cusp of the lower first molar falls in the disto-lingual fossa of the upper first molar, thereby greatly increasing the masticating efficiency of these two teeth. It is well to remember this in making crowns and bridges, but, in giving the occlusion, for the purpose of simplicity, we do not mention the occlusion of the distal cusp except with the disto-buccal.

The mesio-buccal inclined plane of the mesio-buccal cusp of the lower first molar occludes with the disto-lingual inclined plane of the buccal cusp of the upper first premolar. The mesio-lingual inclined plane of the mesio-buccal cusp of the lower first molar occludes with the disto-buccal inclined plane of the lingual cusp of the upper second premolar. The disto-buccal inclined plane of the mesio-buccal cusp of the lower first molar occludes with the mesio-lingual inclined plane of the mesio-buccal cusp of the upper first molar. The disto-lingual inclined plane of the mesio-buccal cusp occludes with the mesio-buccal inclined plane of the mesio-lingual cusp of the upper first molar.

The mesio-buccal inclined plane of the mesio-lingual cusp of the lower first molar occludes with the disto-lingual inclined plane of the lingual cusp of the upper second premolar. The disto-buccal inclined plane of the mesio-lingual cusp of the lower first molar occludes with the mesio-lingual inclined plane of the mesio-lingual cusp of the upper first molar. The lingual inclined planes of the mesio-lingual cusp of the lower first molar have no occlusion. The mesio-buccal inclined plane of the disto-buccal cusp of the lower first molar occludes with the disto-lingual inclined plane of the mesio-buccal cusp of the upper first molar. The mesio-lingual inclined plane of the disto-buccal cusp of the lower first molar occludes with the disto-buccal inclined plane of the mesio-lingual cusp of the upper first molar. The disto-buccal inclined plane of the disto-buccal cusp of the lower first molar occludes with the mesio-lingual inclined plane of the disto-buccal cusp of the upper first molar. The disto-lingual inclined plane of the disto-buccal cusp occludes with the mesio-buccal inclined plane of the disto-lingual cusp of the upper first molar. The mesio-buccal inclined plane of the mesio-lingual cusp of the lower first molar occludes with the disto-lingual inclined plane of the mesio-lingual cusp of the upper first molar. The disto-buccal inclined plane of the disto-lingual cusp of the lower first molar occludes with the mesio-lingual inclined plane of the disto-lingual cusp of the upper first molar.

The lingual inclined planes of the disto-lingual cusp of the lower first molar have no occlusion.

UPPER SECOND MOLAR.

The upper second molar presents the same general outline as the upper first molar, except that it is smaller in all dimensions with less of a tendency for the formation of a lingual cusp on the mesio-lingual lobe of the crown, and a gradual diminution of the disto-lingual cusp, or lobe, in size. It presents the same grooves, ridges, and cusps as the upper first molar. As a general rule, the central fossa is not so deep, the cusps are not so well developed, and the tooth is proportionately narrower in the bucco-lingual direction.

Buccal Surface.

The buccal surface presents the same line angles and point angles as the buccal surface of the upper first molar, but the buccal ridges of the mesio-buccal and disto-buccal cusps are not as a rule as well developed, and the buccal groove is not as well marked. The buccal surface presents less convexity in all directions than the buccal surface of the upper first molar. The gingival marginal ridge is well developed, and is generally straight, or it may be slightly concave, with the concavity towards the occlusal surface.

Lingual Surface.

The lingual surface of the upper second molar presents the same line angles and point angles

and the same ridges and grooves as the lingual surface of the upper first molar. The mesial and distal borders of the lingual surface converge towards the gingival border of the tooth about

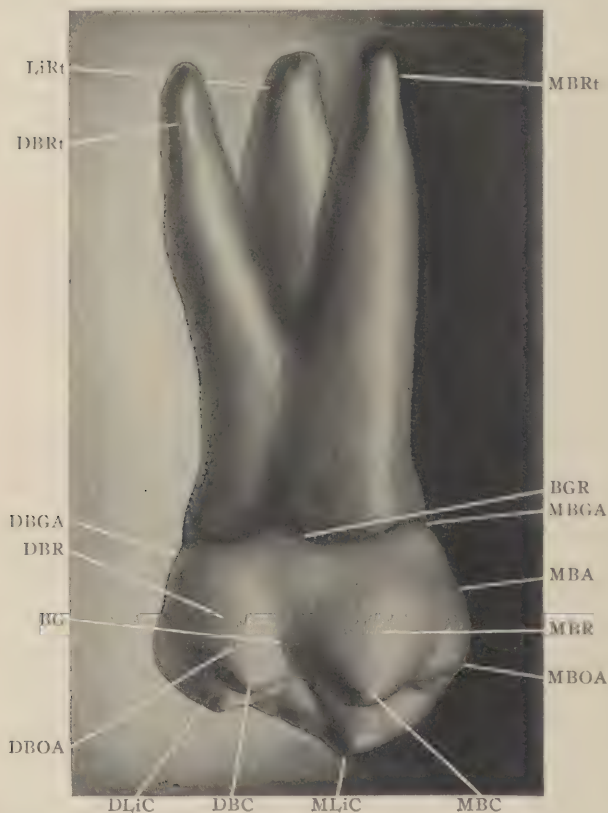


Fig. 75.—Buccal surface of the upper right second molar. LiRt, Lingual root; DBRt, Disto-buccal root; DBGA, Disto-bucco-gingival angle; DBR, Disto-buccal ridge; BG, Buccal groove; DBOA, Disto-bucco-occlusal angle; DLiC, Disto-lingual cusp; DBC, Disto-buccal cusp; MLiC, Mesio-lingual cusp; MBC, Mesio-buccal cusp; MBOA, Mesio-bucco-occlusal angle; MBR, Mesio-buccal ridge; MBA, Mesio-buccal angle; MBGA, Mesio-bucco-gingival angle; BGR, Bucco-lingual ridge; MBRt, Mesio-buccal root.

equally where they join the wide diameter of the lingual root. The lingual groove divides the mesio-lingual and disto-lingual cusps, and may pass gingivally along the lingual border of the

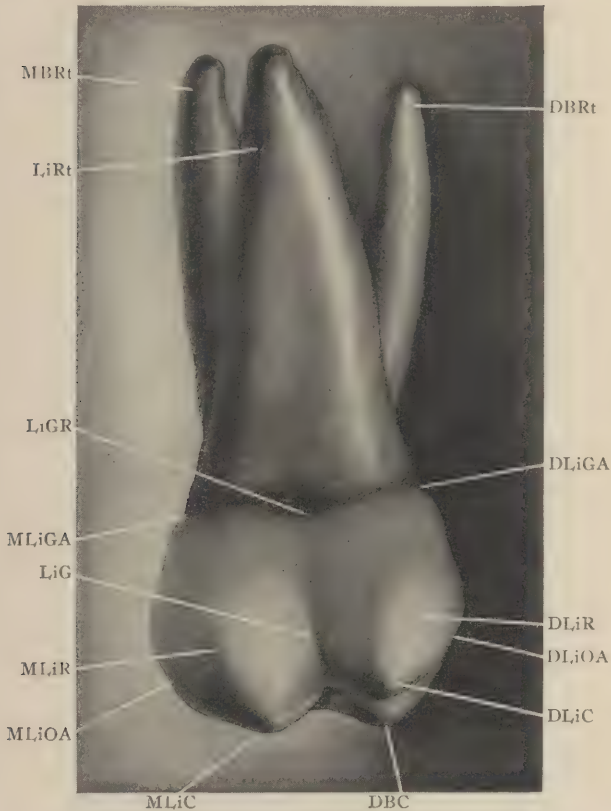


Fig. 76.—Lingual surface of the upper second molar. MBRt, Mesio-buccal root; LiRt, Lingual root; LiGR, Linguo-gingival ridge; MLiGA, Mesio-linguo-gingival angle; LiG, Lingual groove; MLiR, Mesio-lingual ridge; MLiOA, Mesio-linguo-occlusal angle; MLiC, Mesio-lingual cusp; DBC, Disto-buccal cusp; DLiC, Disto-lingual cusp; DLiOA, Disto-linguo-occlusal angle; DLiR, Disto-lingual ridge; DLiGA, Disto-linguo-gingival angle; DBRt, Disto-buccal root.

tooth across the lingual marginal ridge, and can be followed as a groove along the lingual surface of the lingual root.

Mesial and Distal Surfaces.

Owing to the fact that in the majority of the

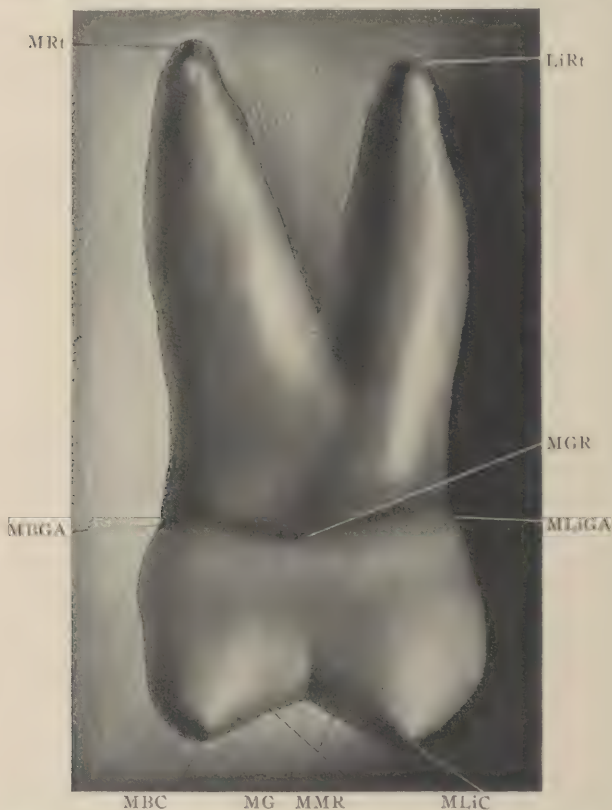


Fig. 77.—Mesial surface of the upper right second molar. MRt, Mesial root; MBGA, Mesio-bucco-gingival angle; MBC, Mesio-buccal cusp; MG, Mesial groove; MMR, Mesial marginal ridge; MLiC, Mesio-lingual cusp; MLiGA, Mesio-linguo-gingival angle; MGR, Mesio-gingival ridge; LiRt, Lingual root.

teeth taken from the same mouth, the crown of the upper second molar is slightly shorter, occluso-lingually, the convexity is comparatively greater than it is in the upper first molar, although there is less tendency towards the forma-

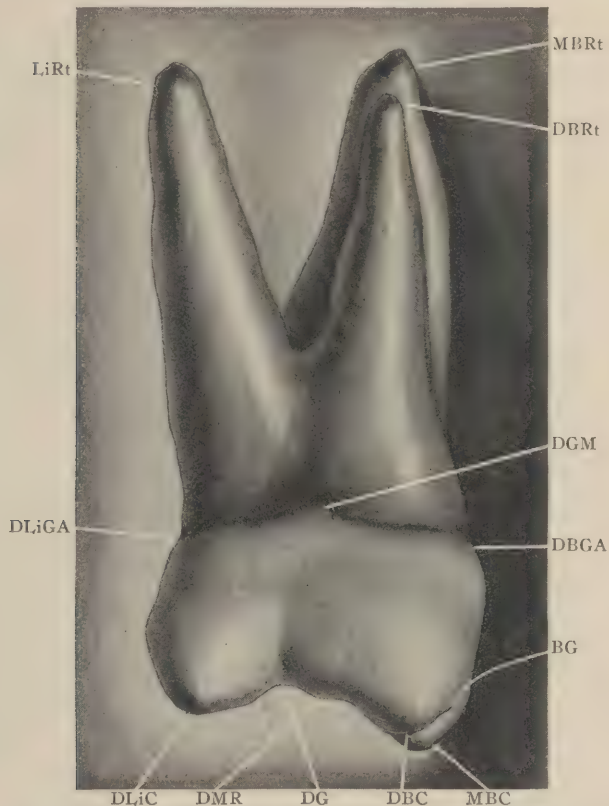


Fig. 78.—Distal surface of the upper right second molar. LiRt, Lingual root; DLiGA, Disto-linguo-gingival angle; DLiC, Disto-lingual cusp; DMR, Distal marginal ridge; DG, Distal groove; DBC, Disto-buccal cusp; MBC, Mesio-buccal cusp; BG, Buccal groove; DBGA, Disto-bucco-gingival angle; DGM, Disto-gingival margin; DBRt, Disto-buccal root; MBRt, Mesio-buccal root.

tion of a concavity near the gingival border. The mesial and distal surfaces present the same line angles and point angles as the corresponding surfaces of the first molar.

Occlusal Surface.

The occlusal surface of the upper second molar is marked by the same ridges and grooves as the upper first molar, although the triangular ridges of the cusp are not usually as well developed and

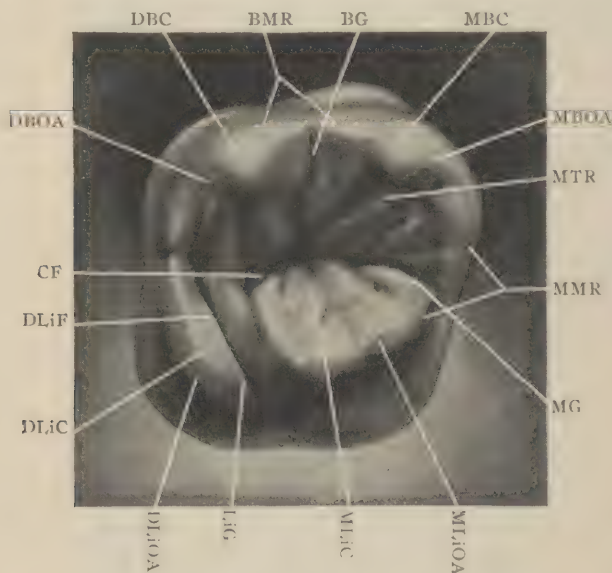


Fig. 79.—Occlusal surface of the upper right second molar. DBOA, Disto-bucco-occlusal angle; CF, Central fossa; DLiF, Disto-lingual fossa; DLiC, Disto-lingual cusp; DLiOA, Disto-linguo-occlusal angle; LiG, Lingual groove; MLiC, Mesio-lingual cusp; MLiOA, Mesio-linguo-occlusal angle; MG, Mesio-groove; MMR, Mesio-marginal ridge; MTR, Mesio-triangular ridge; MBOA, Meso-bucco-occlusal angle; MBC, Meso-buccal cusp; BG, Buccal groove; BMR, Buccal marginal ridges; DBC, Disto-buccal cusp.

the central fossa is not as deep. The disto-lingual fossa is generally smaller, owing to the fact that the disto-lingual lobe of the tooth is not as well developed. The occlusal surface may be narrower in the upper second molar when compared to the diameter of the neck than it is in the upper first molar. There is a greater convergence on both the buccal and lingual surfaces of the tooth towards the crest of the cusp than there is on the upper first molar. In some upper second molars the disto-lingual lobe, or cusp, is very greatly reduced in size; others are only a three-cusped tooth, in which the triangular ridges between the disto-buccal and mesio-lingual cusps become the disto-lingual border of the tooth with an entire absence of the disto-lingual fossa and disto-lingual lobe.

The Root.

The root of the upper second molar presents the same number of fangs and the same general outline as the root of the upper first molar, although it is generally smaller, with a tendency towards diminution in size of the disto-buccal root. The root of the upper second molar presents more variety as to size than the root of the upper first molar, and we occasionally find that instead of the root being bifurcated, there is a tendency for the three prongs to converge together forming a single rooted tooth, the bifurcations of which are marked only by grooves. In some instances we find two of the roots fused to-

gether, in which case it may be the lingual to the distal, or the lingual to the mesio-buccal. It is very rare that we find the mesio-buccal and disto-buccal fused together.

Abnormal Shape.

We have already mentioned the fact that there is a tendency for the upper second molars to be devoid of the disto-lingual cusp forming a three-cusped tooth. In other instances, the entire crown of the upper second molar may present an abnormal anatomical form in which the cusps will be fused together, forming a continuous marginal ridge entirely around the tooth, and the tooth may be flattened in either direction, bucco-lingually or mesio-distally. Similar deformities may appear in the upper third molar, but very seldom do we find them in the upper first.

Pulp Canal.

The shape of the pulp canal, of course, depends on the size and development of the root, but in the typical upper second molar the coronal portion of the pulp corresponds with the crown of the tooth. The size of the pulp canal depends to a certain extent on the size of the root, and will follow the general shape and outline of the root. In some cases the lingual root of the upper second molar, instead of a single pulp canal, may present one which is bifurcated by a calcified portion separating the pulp canal into two or more portions, which makes it very difficult to

treat. Similar formations may be found in either the mesio-buccal or disto-buccal root, but owing to the small size of the pulp canal they are not found as often here as in the lingual root.

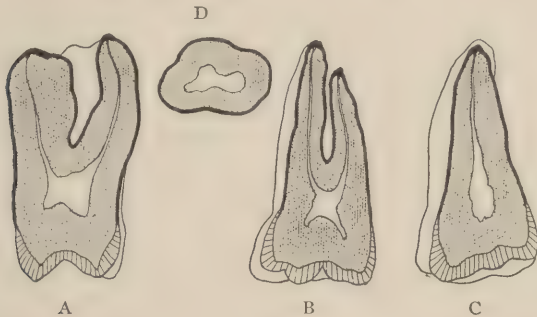


Fig. 80.—Pulp cavity of the upper second molar. A, Mesio-buccal and lingual root; B, Mesio-buccal and disto-buccal root; C, Lingual root; D, Cross section of root.

Occlusion.

The buccal inclined planes of the mesio-buccal cusps of the upper second molar have no occlusion. The mesio-lingual inclined plane of the mesio-buccal cusp of the upper second molar occludes with the disto-buccal inclined plane of the mesio-buccal cusp of the lower second molar. The disto-lingual inclined plane of the mesio-buccal cusp of the upper second molar occludes with the mesio-buccal inclined plane of the disto-buccal cusp of the lower second molar. The mesio-buccal inclined plane of the mesio-lingual cusp of the upper second molar occludes with the disto-lingual inclined plane of the mesio-buccal cusp of the lower second molar. The mesio-lingual inclined

plane of the mesio-lingual cusp of the upper second molar occludes with the disto-buccal inclined plane of the mesio-lingual cusp of the lower second molar. The disto-buccal inclined plane of the mesio-lingual cusp of the upper second molar occludes with the mesio-lingual inclined plane of the disto-buccal cusp of the lower second molar. The disto-lingual inclined plane of the mesio-lingual cusp of the upper second molar occludes with the mesio-buccal inclined plane of the disto-lingual cusp of the lower second molar. The buccal inclined planes of the disto-buccal cusp of the upper second molar have no occlusion. The mesio-lingual inclined plane of the disto-buccal cusp of the upper second molar occludes with the disto-buccal inclined plane of the disto-buccal cusp of the lower second molar. The disto-lingual inclined plane of the disto-buccal cusp of the upper second molar occludes with the mesio-buccal inclined plane of the mesio-buccal cusp of the lower third molar. The mesio-buccal inclined plane of the disto-lingual cusp of the upper second molar occludes with the disto-lingual inclined plane of the disto-buccal cusp of the lower second molar. The mesio-lingual inclined plane of the disto-lingual cusp of the upper second molar occludes with the disto-buccal inclined plane of the disto-lingual cusp of the lower second molar. The disto-buccal inclined plane of the disto-lingual cusp of the upper second molar occludes with the mesio-lingual inclined plane of the mesio-buccal cusp of the lower third molar. The disto-lingual inclined

plane of the disto-lingual cusp of the upper second molar occludes with the mesio-buccal inclined plane of the mesio-lingual cusp of the lower third molar.

Practical Consideration.

Everything that has been said in regard to the first molar applies just as well to the upper second molar. The upper second molar is probably not as prone to caries of the lingual fossa as the upper first molar, but probably greater care must be observed in the filling of the root canal than in filling the first molar, owing to the fact that there is a greater tendency for the roots to be unequally developed and abnormal in size and contour.

LOWER SECOND MOLAR.

The lower second molar presents the same general outline as the lower first molar, with the exception that the occlusal surface is more nearly a rectangle, with the mesio-buccal, disto-buccal, mesio-lingual, and disto-lingual angles more nearly right angles. This is caused by the fact that the lower second molar is a four-cusped tooth, for in the majority of cases the fifth cusp is absent. In a number of lower second molars, however, a fifth cusp develops, in which case the second molar is practically the same as the first or slightly smaller in all respects. In some of the lower races of man both the upper and lower second molars are larger than the first.

Buccal Surface.

The buccal surface of the lower second molar presents four line angles and four point angles,

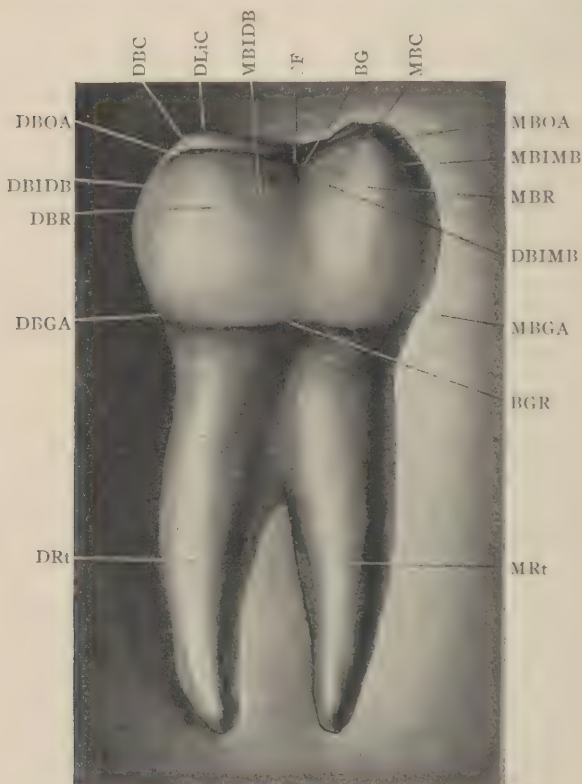


Fig. 81.—Buccal surface of the lower right second molar. DBOA, Disto-bucco-occlusal angle; DBIDB, Disto-buccal inclined plane of disto-buccal cusp; DBR, Disto-buccal ridge; DEGA, Disto-bucco-gingival angle; DRt, Distal root; MRt, Mesial root; BGR, Bucco-gingival ridge; MBGA, Mesio-bucco-gingival angle; DBIMB, Disto-buccal inclined plane of mesio-buccal cusp; MBR, Mesio-buccal ridge; MBIMB, Mesial-buccal inclined plane of mesio-buccal cusp; MBOA, Mesio-bucco-occlusal angle; MBC, Mesio-buccal cusp; BG, Buccal groove; CF, Central fossa; MBIDB, Mesio-buccal inclined plane of disto-buccal cusp; DLiC, Disto-lingual cusp; DBC, Disto-buccal cusp.

the line angles being the occlusal, mesial, gingival, and distal. The point angles are the mesio-occlusal, mesio-gingival, disto-gingival, and disto-occlusal. The occlusal line angle is made up of the tip of the mesio-buccal and disto-buccal cusps and the marginal ridge of the two cusps is separated by the buccal groove, which arises in the central fossa and passes over the occlusal marginal ridge along the buccal surface of the tooth gingivally. The buccal groove divides the buccal surface of the lower second molar into two lobes, which make up the buccal convexity of the mesio-buccal and disto-buccal cusps. The highest points on the convexity of these two cusps are known as the buccal ridges of the mesio-buccal and disto-buccal cusps. The mesial and distal line angles of the buccal surface are convex about equally and converge towards the center of the tooth gingivally. The gingival border may be nearly straight, or slightly convex, with the convexity towards the root. In the four-cusped lower second molar, there is neither a disto-buccal groove nor distal cusp on the buccal surface.

Lingual Surface.

The lingual surface of the lower second molar presents the same point angles and line angles as the buccal surface. The lingual surface is crossed by the lingual groove, which arises in the central fossa and passes over the lingual surface gingivally towards the gingival border of the tooth. The mesial and distal line angles of the

lingual surface converge almost equally towards the center of the tooth gingivally. In most instances the gingival border of the tooth is almost straight, or it may present a convexity towards

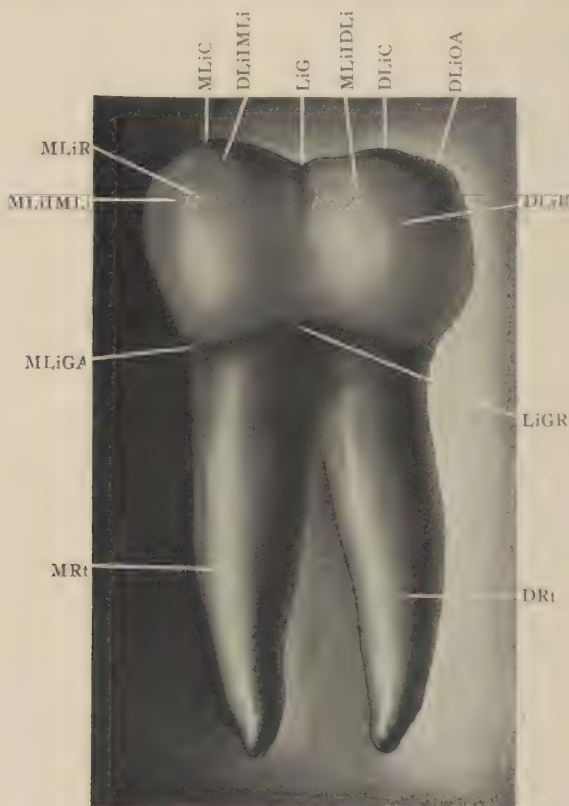


Fig. 82.—Lingual surface of the lower second molar. MLiR, Mesio-lingual ridge; MLiIMLi, Mesio-lingual inclined plane of mesio-lingual cusp; MLiGA, Mesio-linguo-gingival angle; MRt, Mesial root; DRt, Distal root; LiGR, Linguo-gingival ridge; DLiR, Disto-lingual ridge; DLiOA, Disto-linguo-occlusal angle; DLiC, Disto-lingual cusp; MLiDLi, Mesio-lingual inclined plane of disto-lingual cusp; LiG, Lingual groove; DLiIMLi, Disto-lingual inclined plane of mesio-lingual cusp; MLiC, Mesio-lingual cusp.

the root. Where there is a tendency for a concavity to develop near the neck of the tooth, the gingival border may have the appearance of being convex with the convexity towards the occlusal surface, as shown in Fig. 82. The lingual surface is convex in all directions, with the greatest amount of convexity in the occlusal third, when it gradually slopes towards the gingival border.

Mesial Surface.

The mesial surface of the lower second molar is bounded by four point angles, the bucco-occlusal, bucco-gingival, linguo-gingival, and linguo-occlusal, and four line angles, the occlusal, buccal, gingival, and lingual. The occlusal line angle of the mesial surface is made up of the marginal ridges of the mesio-lingual and mesio-buccal cusps and presents a concavity towards the occlusal portion. The mesio-occlusal margin is crossed by the mesial groove, which arises in the central fossa, and which may be followed a third or fourth of the way along the mesial surface gingivally. The gingival surface is a well marked convex ridge in the enamel, with the convexity towards the crown. The buccal margin of the mesial surface is decidedly convex in the gingival third, and slopes gradually towards the occlusal border. The lingual line angle is convex in the occlusal third and slopes gradually towards the gingival border. Therefore, the greatest diameter of the mesial surface is from the bucco-gingival border to the linguo-occlusal border. The

mesial border of the lower second molar is convex in all directions and usually a little more convex than the lower first molar. A slight concavity may be present near the gingival border of the mesial surface of some second molars.

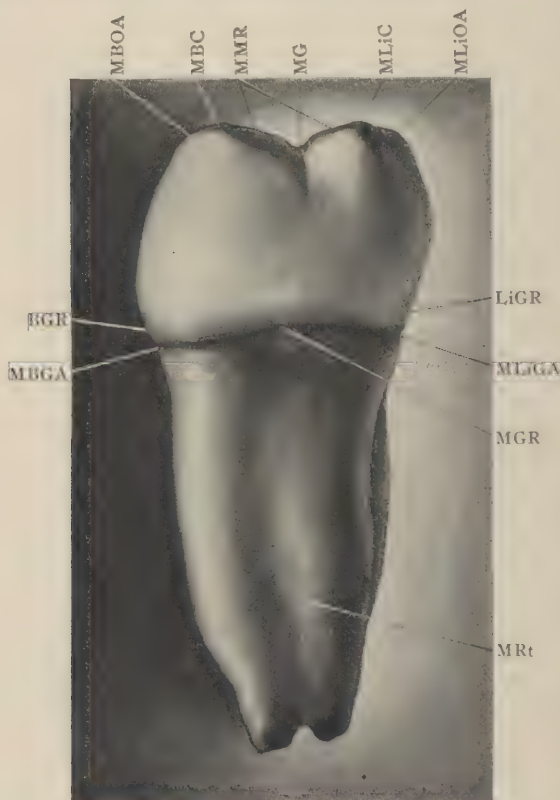


Fig. 83.—Mesial surface of the lower right second molar. BGR, Bucco-gingival ridge; MBGA, Mesio-bucco-gingival angle; MRt, Mesial root; MGR, Mesio-gingival ridge; MLiGA, Mesio-linguo-gingival angle; LiGR, Linguo-gingival ridge; MLiOA, Mesio-linguo-occlusal angle; MLC, Mesio-lingual cusp; MG, Mesial groove; MMR, Mesial marginal ridge; MBC, Mesio-buccal cusp; MBOA, Mesio-bucco-occlusal angle.

Distal Surface.

The distal surface of the lower second molar presents the same line angles and point angles as the mesial surface. The occlusal margin is

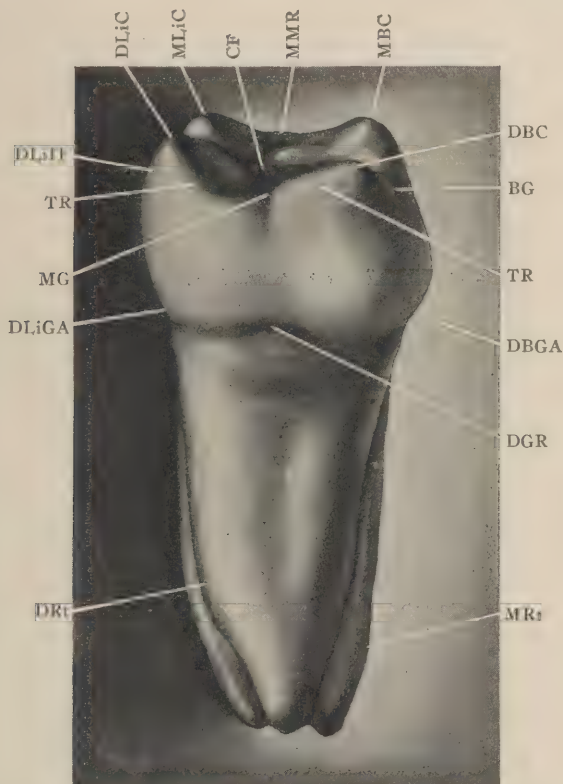


Fig. 84.—Distal surface of the lower right second molar. DLiIP, Disto-lingual inclined plane; TR, Triangular ridge; MG, Mesial groove; DLiGA, Disto-linguo-gingival angle; DRT, Distal root; MRT, Mesial root; DGR, Disto-gingival ridge; DBGA, Disto-bucco-gingival angle; TR, Triangular ridge; BG, Buccal groove; DBC, Disto-buccal cusp; MBC, Mesio-buccal cusp; MMR, Mesial marginal ridge; CF, Central fossa; MLiC, Mesio-lingual cusp; DLiC, Disto-lingual cusp.

crossed by the distal groove, which arises in the central fossa and passes along the distal surface of the tooth. The distal surface is convex buccolingually and ocluso-lingivally, with the greatest amount of convexity nearer the center of the tooth than on the lower first molar, which brings the proximating point on the lower second molar nearer the center of the distal surface than the buccal as in the lower first molar. The occlusal border is concave occlusally, while the gingival border is generally convex occlusally.

Occlusal Surface.

The occlusal surface of the lower second molar in the four-cusped tooth is almost a rectangle, or a modified parallelogram, with the point angles almost equal. The occlusal surface is bounded by the four marginal ridges, the mesial and distal and the occlusal marginal ridges of the buccal and lingual cusps. The mesial and distal marginal ridges are near the mesio-distal border of the tooth, while the bucco-occlusal ridges are brought towards the center because of the convexity of the buccal surface. The marginal ridges on the lingual side are nearer the lingual border than the buccal marginal ridges are near the buccal border. The occlusal surface is divided into four lobes by the central fossa, from which originate the mesial groove, the distal groove, the buccal groove, and the lingual groove. The mesial groove arises in the central fossa and separates the triangular ridges of the mesio-buccal and me-

sio-lingual cusps, passes across the mesial marginal ridge, and may be followed for a short distance along the mesial surface. The buccal groove arises near the center of the tooth at the central fossa, and passes buccally, separating the mesio-buccal from the disto-buccal cusp, crosses the occlusal marginal ridge and passes gingivally along the buccal surface, or it may terminate in a

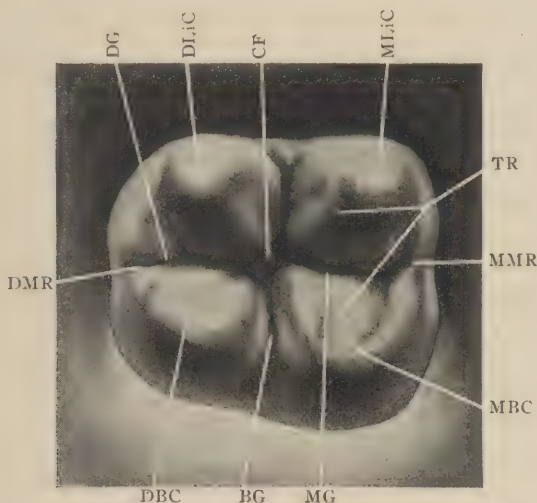


Fig. 85.—Occlusal view of the lower right second molar. DMR, Distal marginal ridge; DBC, Disto-buccal cusp; BG, Buccal groove; MG, Mesial groove; MBC, Mesio-buccal cusp; MMR, Mesial marginal ridge; TR, Triangular ridges; MLiC, Mesio-lingual cusp; CF, Central fossa; DLiC, Disto-lingual cusp; DG, Distal groove.

pit. The distal groove arises in the central fossa and passes over the distal margin of the tooth, separating the triangular ridges of the disto-buccal and disto-lingual cusps, and may be followed for a short distance along the distal surface. The

lingual groove arises in the center of the occlusal surface and passes lingually over the linguo-occlusal margin, separating the mesio-lingual from the disto-lingual cusp, and, sometimes, can be followed along the lingual surface of the tooth nearly to the gingival border. Instead of the mesial and distal being a single groove, as is generally the case, it may be divided into two or three branches which cross the mesial or distal margin. In addition to the groove above mentioned, there is generally a bucco-triangular groove, which arises in the mesial portion of the central fossa and passes towards the mesio-buccal angle of the tooth, separating the triangular ridge of the mesio-buccal cusp from the marginal ridge. A similar groove may be found in the mesio-lingual angle of the tooth, also at the disto-buccal and disto-lingual angles, separating, respectively, the triangular ridges of the disto-buccal, mesio-lingual, and disto-lingual cusps from the marginal ridges. The mesio-buccal cusp of the lower second molar presents four ridges, the buccal, triangular, mesio-buccal, and disto-buccal marginal ridges. The buccal ridge of the mesio-buccal cusp rises at the tip of the cusp and passes gingivally, forming the greatest convexity of the mesio-buccal lobe of the tooth. The triangular ridge of the mesio-buccal cusp arises at the tip of the buccal cusp and passes centrally towards the central fossa, and is separated from the other ridges by the buccal groove, the central fossa, and the mesio-buccal tri-

angular groove. The mesio-bucco-occlusal and disto-bucco-occlusal ridges arise at the tip of the buccal cusps and pass, respectively, mesially and distally. The mesio-lingual, disto-lingual, and disto-buccal cusps have the same ridges, respectively, as the mesio-buccal. The triangular ridge of the mesio-buccal and mesio-lingual cusp forms the mesial transverse ridge of the occlusal surface. The triangular ridge of the disto-buccal and disto-lingual cusp forms the distal transverse ridge of the occlusal surface. The mesio-buccal and disto-buccal cusps are the principal occluding cusps of the lower second molar, and they present four occlusal surfaces. The mesio-lingual cusp, as a rule, is a little larger than the disto-lingual cusp. In lower second molars, in which the transverse ridges are well developed, there may be a mesial and distal supplemental fossa between the mesial and distal marginal ridges and the respective mesial and distal transverse ridges. These supplementary fossæ greatly increase the masticating efficiency of the teeth by causing a greater irregularity in the occlusal surface of the molar.

The Root.

The root of the lower second molar is similar to the root of the lower first molar except that there is not as much convergence between the mesial and distal roots and not as great a tendency for the formation of a curve at the apex of the two prongs. The mesial prong has a tendency to be grooved on the mesial and distal sides, and

presents a much greater diameter bucco-lingually than it does mesio-distally. The distal root has a tendency to be more nearly round, and is not grooved on the distal side as frequently as the mesial root. Sometimes the mesial root is divided a third or half the way occlusally. In other lower second molars, instead of there being a mesial and distal root, the prongs may be fused together with only a groove to distinguish the tendency of the mesial and distal root.

Pulp Canal.

The pulp canal in the coronal portion of the tooth follows the same general outline as the

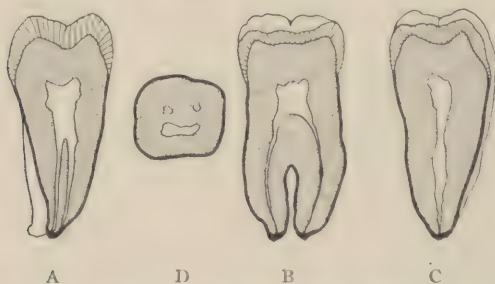


Fig. 86. Pulp cavity of the lower second molar. A, Pulp cavity of mesial root; B, Pulp cavity of mesial and distal roots; C, Pulp cavity of distal root; D, Cross section of pulp cavity.

crown, and, in the root portion, follows the same outline at the root. The pulp canal of the mesial root is generally divided into a buccal and lingual division, which may be complete or only partial. The distal pulp canal is more nearly round. The greatest diameter of the pulp canal of the distal root is bucco-lingually.

Occlusion.

The mesio-buccal inclined plane of the mesio-buccal cusp of the lower second molar occludes with the disto-lingual inclined plane of the disto-buccal cusp of the upper first molar. The mesio-lingual inclined plane of the mesio-buccal cusp of the lower second molar occludes with the disto-buccal inclined plane of the disto-lingual cusp of the upper first molar. The mesio-buccal inclined plane of the mesio-lingual cusp of the lower second molar occludes with the disto-lingual inclined plane of the disto-lingual cusp of the upper first molar. The mesio-lingual inclined plane of the mesio-lingual cusp of the lower second molar has no occlusion. The disto-buccal inclined plane of the mesio-buccal cusp of the lower second molar occludes with the mesio-lingual inclined plane of the mesio-buccal cusp of the upper second molar. The disto-lingual inclined plane of the mesio-buccal cusp of the lower second molar occludes with the mesio-buccal inclined plane of the mesio-lingual cusp of the upper second molar. The disto-buccal inclined plane of the mesio-lingual cusp of the lower second molar occludes with the mesio-lingual inclined plane of the mesio-lingual cusp of the upper second molar. The disto-lingual inclined plane of the mesio-lingual cusp has no occlusion. The mesio-buccal inclined plane of the disto-buccal cusp of the lower second molar occludes with the disto-lingual inclined plane of the mesio-buccal cusp of the upper second molar.

The mesio-lingual inclined plane of the disto-buccal cusp of the lower second molar occludes with the disto-buccal inclined plane of the mesio-lingual cusp of the upper second molar. The mesio-buccal inclined plane of the disto-lingual cusp of the lower second molar occludes with the disto-lingual inclined plane of the mesio-lingual cusp of the upper second molar. The mesio-lingual inclined plane of the disto-lingual cusp of the lower second molar has no occlusion. The disto-buccal inclined plane of the disto-buccal cusp of the lower second molar occludes with mesio-lingual inclined plane of the disto-buccal cusp of the upper second molar. The disto-lingual inclined plane of the disto-buccal cusp of the lower second molar occludes with the mesio-buccal inclined plane of the disto-lingual cusp of the upper second molar. The disto-buccal inclined plane of the disto-lingual cusp of the lower second molar occludes with the mesio-lingual inclined plane of the disto-lingual cusp of the upper second molar. The disto-lingual inclined plane of the disto-lingual cusp of the lower second molar has no occlusion.

Practical Consideration.

Owing to the fact that the triangular ridges of the occlusal surface of the lower second molar are better developed than they are in the first molar, the central fossa, as a rule, is deeper, and there is a greater tendency for fissures to form in the supplementary grooves.

In making restorations which involve the mesial and distal convexity of the tooth, it must be remembered that the distal proximate contact point is nearer the center than the mesial proximate contact point, and that the distal proximate contact point is nearer the center than the distal proximate contact point of the lower first molar. Therefore, in making anatomical restorations, these points must be remembered in order that the convexity may be restored so as to protect the gingival gum tissue. Care must also be observed in opening into the mesial root, owing to the fact that those pulp canals generally bifurcate, are small near the apical foramen, and, if not properly treated, are liable to produce abscesses. In making crowns and bridges, different convexities of the buccal and lingual sides must be carefully reproduced in order to so shape the tooth as to protect the gingival gum tissue from food during the process of mastication.

UPPER THIRD MOLAR.

The upper third molar is the smallest of the molar series, and differs from the first and second molars in that the disto-lingual lobe is much reduced in size. With the reduction of the disto-lingual lobe, the disto-lingual fossa becomes smaller, and the ridge between the disto-buccal and mesio-lingual cusps becomes more noticeable. In fact, about three-fourths of the upper third molars may be considered as three-cusped teeth,

with the disto-lingual cusp only as a small tubercle, or, in some instances, entirely absent. The crown is reduced in size, and there is a tendency for the roots to be fused together, separated only

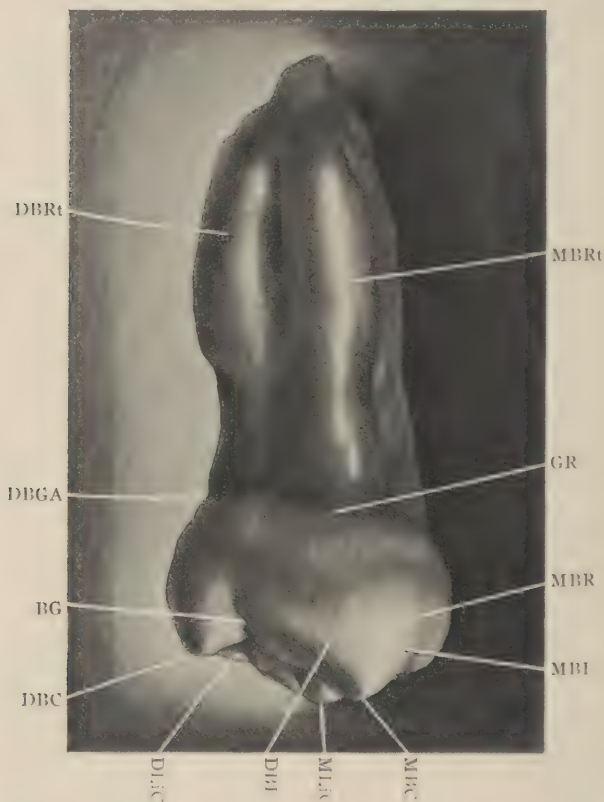


Fig. 87.—Buccal surface of the upper right third molar. DBRt, Disto-buccal root; DEGA, Disto-bucco-gingival angle; BG, Buccal groove; DBC, Disto-buccal cusp; DLiC, Disto-lingual cusp; DBI, Disto-buccal incline; MLIc, Mesio-lingual cusp; MBC, Mesio-buccal cusp; MBI, Mesio-buccal inclined plane of mesio-buccal cusp; MBR, Mesio-buccal ridge; GR, Gingival ridge; MBRt, Mesio-buccal root.

by grooves, or they may be separated into several prongs.

Buccal Surface.

The buccal surface of the upper third molar presents the same line angles and point angles as the upper first and second molars. As a rule, the buccal groove is nearer the distal surface of the tooth and the mesio-buccal lobe is larger than the disto-buccal lobe. The buccal surface is convex in all directions with the greatest amount of convexity near the central portion of the tooth. Owing to the fact that the crown of the upper third molar varies considerably, in some instances, we may find the greatest convexity at the gingival margin, and, again, it may be nearer the occlusal surface.

Lingual Surface.

The lingual surface of the upper third molar is decidedly convex mesio-distally, owing to the fact that the disto-lingual lobe is very small. The greatest amount of convexity is in the region of the mesio-lingual cusp, and in the majority of teeth the lingual cusp takes up nearly three-fourths of the entire surface. The disto-lingual lobe is very short, and does not extend occlusally as far as the mesio-lingual cusp. The lingual groove is placed in the distal portion of the lingual surface, and is very indistinctly developed in the majority of teeth. The mesio-lingual cusp presents a well developed lingual ridge.

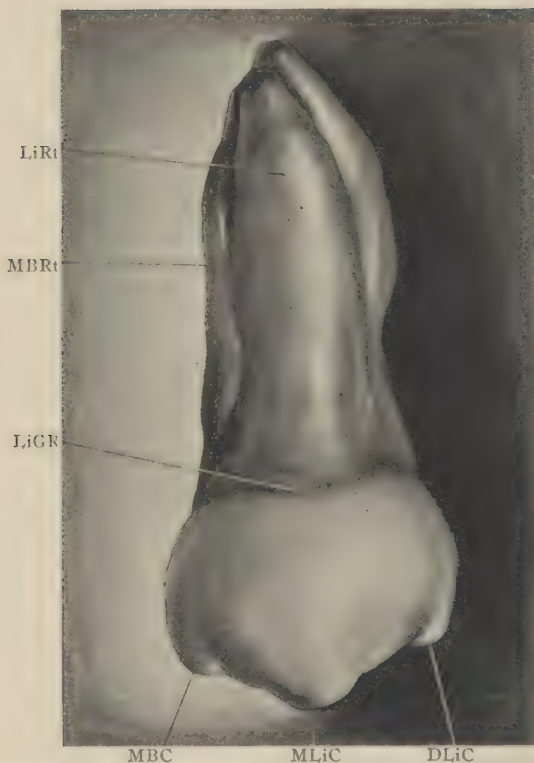


Fig. 88.—Lingual surface of the upper right third molar. LiRt, Lingual root; MBRt, Mesio-buccal root; LiGR, Linguo-gingival ridge; MBC, Mesio-buccal cusp; MLiC, Mesio-lingual cusp; DLiC, Disto-lingual cusp.

Mesial Surface.

The mesial surface of the upper third molar presents the same point angles and line angles as the mesial surfaces of either the first or second molars, but the surface is usually decidedly convex and it is very seldom that a concavity develops near the gingival border of the mesial sur-

face. The occlusal marginal ridge of the mesial surface is fairly well developed and is generally crossed by the mesial groove, which is quite distinct. The gingival border is generally curved with the convexity towards the root.

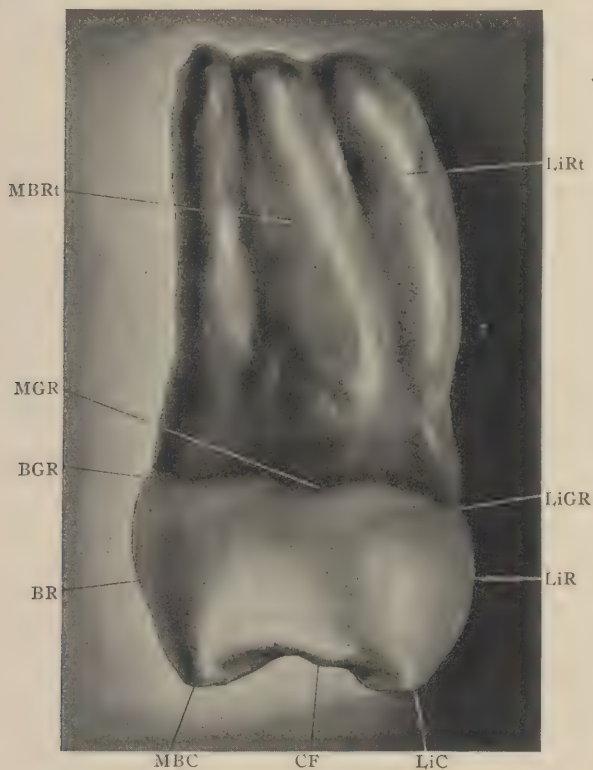


Fig. 89.—Mesial surface of the upper right third molar. MBRt, Mesio-buccal root; MGR, Mesio-gingival ridge; BGR, Bucco-gingival ridge; BR, Buccal ridge; MBC, Mesio-buccal cusp; CF, Central fossa; LiC, Lingual cusp; LiR, Lingual ridge; LiGR, Linguo-gingival ridge; LiRt, Lingual root.

Distal Surface.

The distal surface of the upper third molar is decidedly smaller bucco-lingually than the mesial surface because of the small size of the disto-lingual cusp. The disto-buccal angle of the distal surface is well developed, owing to the fact that

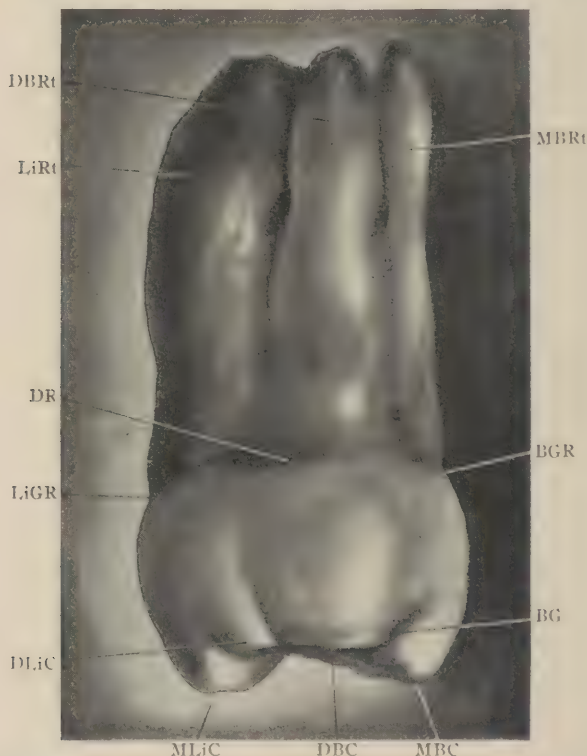


Fig. 90.—Distal surface of the upper right third molar. DBRt, Disto-buccal root; LiRt, Lingual root; DR, Distal ridge; LiGR, Linguo-gingival ridge; DLiC, Disto-lingual cusp; MLiC, Mesio-lingual cusp; DBC, Disto-buccal cusp; MBC, Mesio-buccal cusp; BG, Buccal groove; BGR, Bucco-gingival ridge; MBRt, Mesio-buccal root.

the disto-buccal cusp is a large cusp in the majority of these teeth. The distal surface gradually slopes towards the lingual, and joins the lingual surface at an obtuse angle.

Occlusal Surface.

The occlusal surface of the upper third molar presents the same ridges and grooves as far as

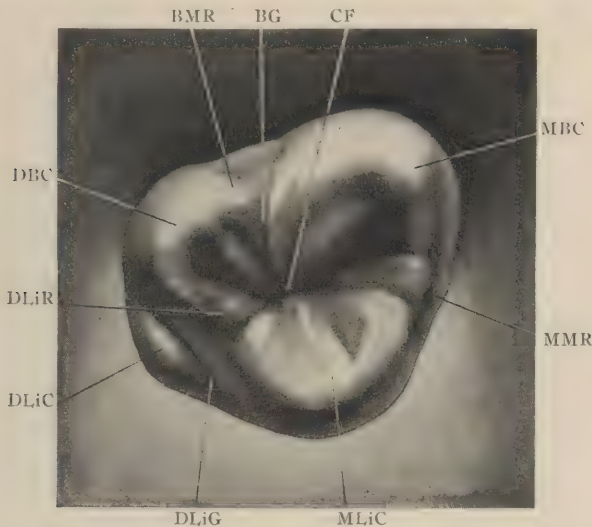


Fig. 91.—Occlusal surface of the upper right third molar. DBC, Disto-buccal cusp; DLiR, Disto-lingual ridge; DLiC, Disto-lingual cusp; DLiG, Disto-lingual groove; MLiC, Mesio-lingual cusp; MMR, Mesio-marginal ridge; MBC, Mesio-buccal cusp; CF, Central fossa; BG, Buccal groove; BMR, Buccal marginal ridge.

the mesio-buccal, mesio-lingual, and disto-buccal cusps are concerned. The central fossa is generally well developed, although it forms more of a pit than in any of the other teeth. The triangular ridges of the mesio-buccal, mesio-lingual

and disto-buccal cusps are fairly well developed, and are separated by the same grooves that separate the triangular ridges of the other upper molars. The oblique ridge between the disto-buccal and mesio-lingual cusps is quite prominent, owing to the fact that the disto-lingual fossa and the disto-lingual cusp are very small. In those teeth in which the disto-lingual cusp is absent, we find that the occlusal surface is triangular, and that the oblique ridge forms the disto-lingual margin of the occlusal surface.

The Root.

The root of the typical upper third molar presents the three fangs that are found in the other teeth, and are named the mesio-buccal, disto-buccal, and lingual. These fangs, even when separated the entire distance as in the other teeth, do not diverge as much, and are generally fused together and separated only by grooves. In some instances, the upper third molar presents only a single root with a single pulp cavity, while in others it presents a single root with three or more pulp cavities or canals, and in still others it presents four, five, or six roots; in fact it has a more irregular outline than any of the other teeth. Cases have been reported in which the upper third molar possessed seven or eight roots or fangs.

Pulp Cavity.

The roots of the upper third molar are irregular in shape and outline and consequently the pulp

canal may also present the same irregular shape. In cases where the upper third molar presents three prongs, we find that the pulp canal follows the outline of the prongs, but always with a tendency to be more irregular in outline and shape

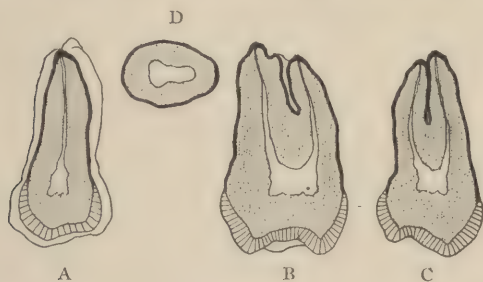


Fig. 92.—Pulp cavity of the upper third molar. A, lingual root; B, Bucco-lingual diameter; C, Mesio-distal diameter; D, Cross section of pulp cavity.

than the pulp canal of any of the other molars. The single-rooted third molars may have a large single pulp canal, or they may have a large central canal with several bifurcations, which make it very difficult to open and treat.

Occlusion.

The buccal inclined planes of the mesio-buccal and disto-buccal cusps have no occlusion. The mesio-lingual inclined plane of the mesio-buccal cusp of the upper third molar occludes with the disto-buccal inclined plane of the mesio-buccal cusp of the lower third molar. The disto-lingual inclined plane of the mesio-buccal cusp of the upper third molar occludes with the mesio-buccal

inclined plane of the disto-buccal cusp of the lower third molar. The mesio-lingual inclined plane of the disto-buccal cusp of the upper third molar occludes with the disto-buccal inclined plane of the disto-buccal cusp of the lower third molar. The disto-lingual inclined plane of the disto-buccal cusp of the upper third molar has no occlusion. The mesio-buccal inclined plane of the mesio-lingual cusp of the upper third molar occludes with the disto-lingual inclined plane of the mesio-buccal cusp of the lower third molar. The mesio-lingual inclined plane of the mesio-lingual cusp of the upper third molar occludes with the disto-buccal inclined plane of the mesio-lingual cusp of the lower third molar. The disto-buccal inclined plane of the mesio-lingual cusp of the upper third molar occludes with the mesio-lingual inclined plane of the disto-buccal cusp of the lower third molar. The disto-lingual inclined plane of the mesio-lingual cusp of the upper third molar occludes with the mesio-buccal inclined plane of the disto-lingual cusp of the lower third molar. The mesio-buccal inclined plane of the disto-lingual cusp of the upper third molar occludes with the disto-lingual inclined plane of the disto-buccal cusp of the lower third molar. The mesio-lingual inclined plane of the disto-lingual cusp of the upper third molar occludes with the disto-buccal inclined plane of the disto-lingual cusp of the lower third molar. The distal inclined planes of the disto-lingual cusp of the upper third molar have no occlusion.

Practical Consideration.

Owing to the fact that the central fossa of the upper third molar is usually a deep pit with a well developed marginal ridge, there is a great tendency for occlusal cavities to develop in the upper third molar. Should the pulps become exposed and should it be found necessary to devitalize the upper third molar, care must be taken to open into all of the pulp canals, and every means available should be employed in order to obtain the anatomical shape of the tooth so as to make the filling of the pulp canal a success. Some operators have advised the extraction of the upper third molar for the slightest possible cause, owing to the fact that the root canals are so difficult to fill. However this plan is not to be recommended; if at all possible, the upper third molar should be maintained in the mouth in order to preserve the proximate contact between the upper second and third molars, and in a great many instances it is the last molar to be lost and can be utilized as an anchor tooth for bridges and removable dentures. As a rule, the upper third molar erupts without any serious consequences, but it may be deflected towards the cheek in such a manner as to cause inflammation of the cheek, which then makes it necessary to resort to extraction.

LOWER THIRD MOLAR.

The lower third molar is the last one of the lower molars, the eighth from the median line, and

proximates the lower second molar on the distal side. The lower third molar varies to a greater extent, in shape and size and in the formation of the crown and root, than any of the other molars. In some cases the lower third molar is the smallest tooth; in others, it may be the largest. It may possess four cusps similar to those of the lower second molar, or five cusps similar to those of the lower first molar, or it may present a variety different from any of the others whereby the occlusal surface will be made up of a large number of wrinkles and grooves, presenting an irregular number of cusps as regards the arrangement and location, or the occlusal surface may simply be wrinkled in the central fossa, with a large number of grooves radiating outward and crossing the marginal ridges. The four-cusped lower molar may be considered as a typical form and presents the same general outline and shape as the lower second molar.

Buccal Surface.

The buccal surface of the lower third molar presents the same grooves and ridges and the same point angles and line angles as the buccal surface of the lower second molar. The distobuccal cusp is usually smaller than the mesio-buccal cusp. The tooth shown in Fig. 93 is a more highly developed third molar than is usually found, and the tip of the buccal cusp is also well developed. The gingival marginal ridge of the buccal surface is generally concave, with the con-

cavity towards the occlusal surface, or it may be almost straight. The occlusal margin of the buccal surface is surmounted by the tip of the disto-

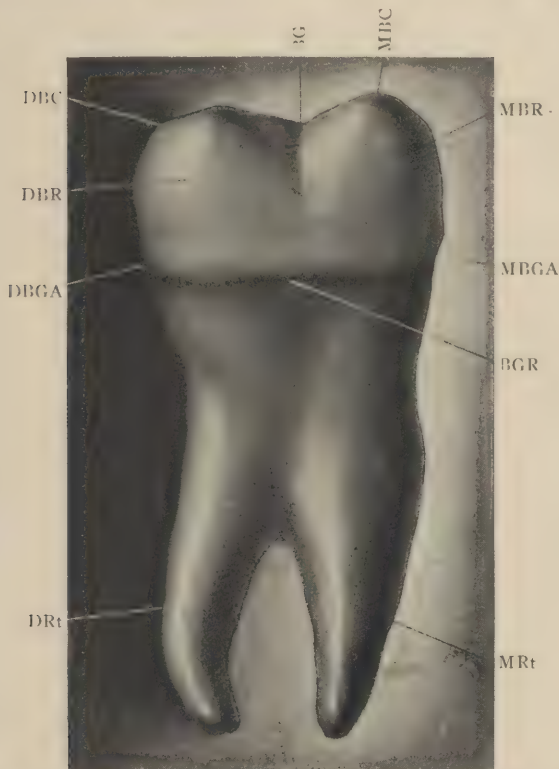


Fig. 93.—Buccal surface of the lower third molar. DBC, Disto-buccal cusp; DBR, Disto-buccal ridge; DEGA, Disto-bucco-gingival angle; DRt, Distal root; MRt, Mesial root; BGR, Bucco-gingival ridge; MBGA, Mesio-bucco-gingival ridge; MBR, Mesio-buccal ridge; MBC, Mesio-buccal cusp; BG, Buccal groove.

buccal and mesio-buccal cusp. The buccal surface is convex occluso-gingivally and mesio-distally and the greatest amount of convexity is near the gingival third.

Lingual Surface.

The lingual surface of the typical lower third molar is slightly smaller than the buccal surface, and presents a convexity occluso-lingually and

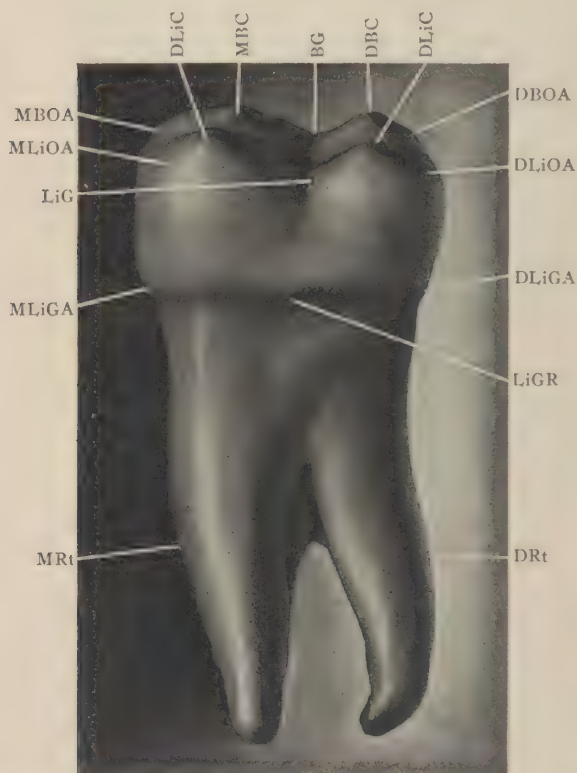


Fig. 94.—Lingual surface of the lower right third molar. MBOA, Mesio-bucco-occlusal angle; MLiOA, Mesio-linguo-occlusal angle; LiG, Lingual groove; MLiGA, Mesio-linguo-gingival angle; MRt, Mesial root; DRt, Distal root; LiGR, Linguo-gingival ridge; DLiGA, Disto-linguo-gingival angle; DLiOA, Disto-linguo-occlusal angle; DBOA, Disto-bucco-occlusal angle; DLiC, Disto-lingual cusp; DBC, Disto-buccal cusp; BG, Buccal groove; MBC, Mesio-buccal cusp; DLiC, Disto-lingual cusp.

mesio-distally. It is crossed near the central portion by the lingual groove, which may be placed somewhat closer to the distal than the mesial, owing to the fact that the mesio-lingual cusp is slightly larger than the disto-lingual.

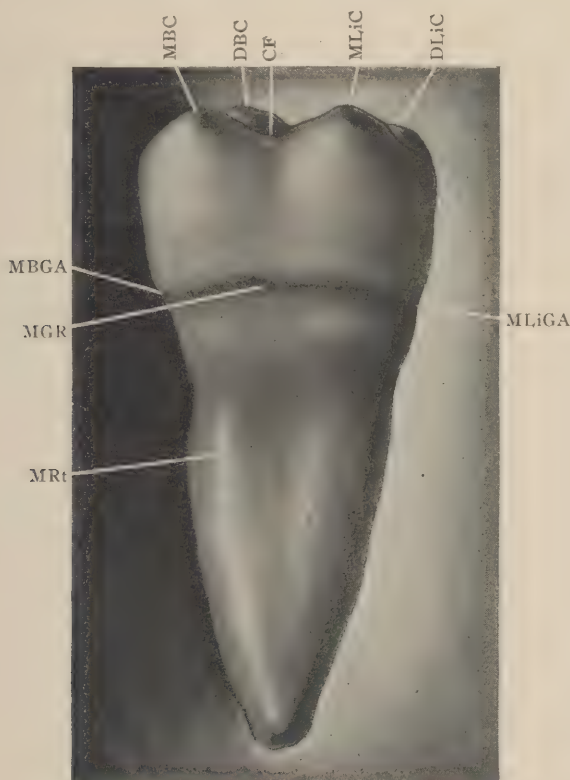


Fig. 95.—Mesial surface of the lower right third molar. MBGA, Mesio-bucco-gingival angle; MGR, Mesio-gingival ridge; MRt, Mesial root; MLiGA, Mesio-linguo-gingival angle; DLiC, Disto-lingual cusp; MLiC, Mesio-lingual cusp; CF, Central fossa; DBC, Disto-buccal cusp; MBC, Mesio-buccal cusp.

Mesial and Distal Surfaces.

The mesial and distal surfaces of the typical lower third molar present the same line angles and point angles as the mesial and distal surfaces of the second molar. They are convex in all di-

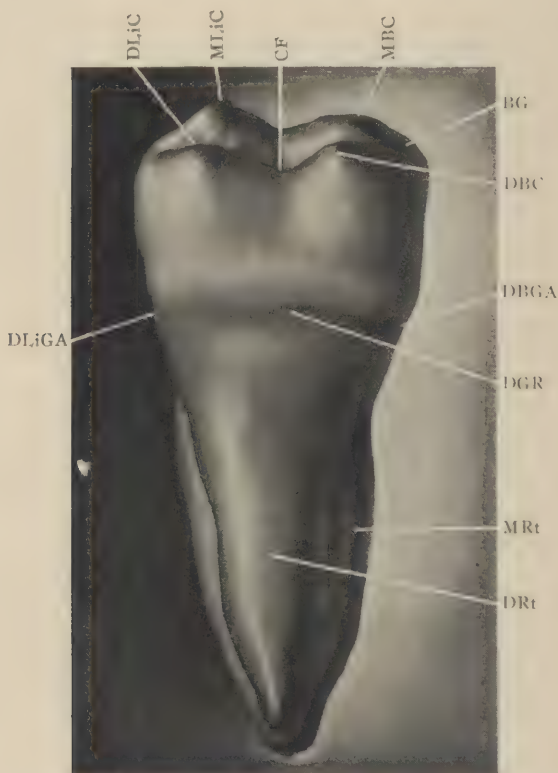


Fig. 96.—Distal surface of the lower right third molar. DLiGA, Disto-linguo-gingival angle; DRt, Distal root; MRt, Mesial root; DGR, Disto-gingival ridge; DBGA, Disto-bucco-gingival angle; DBC, Disto-buccal cusp; BG, Buccal groove; MBC, Mesio-buccal cusp; CF, Central fossa; MLiC, Mesio-lingual cusp; DLiC, Disto-lingual cusp.

rections, the greatest amount of convexity being near the occlusal border. As a rule the mesial surface is more convex than the distal surface, as the mesio-occlusal marginal ridge is more highly developed than the disto-occlusal marginal ridge.

In the five-lobed or five-cusped lower third molar, the tooth is larger than the lower second molar owing to the development of the distal cusp. The distal cusp is generally placed near the mesio-distal center of the tooth, the buccal surface is decidedly rounded, and the crown of the tooth is generally shorter occluso-gingivally. Very often these five-cusped lower third molars present a very large crown with a root much smaller than that of the lower first molar or even smaller than that of the lower second molar.

Occlusal Surface.

The occlusal surface of the four-cusped lower third molar presents the same ridges and grooves as the lower second molar. The mesio-distal diameter of the buccal surface is larger than the mesio-distal diameter of the lingual surface. The central fossa may be irregular in outline with a large number of supplementary grooves radiating out a short distance, in addition to the four grooves, mesial, distal, buccal and lingual, which are typical of a four-cusped lower molar. The triangular ridges are not as well developed. The crown as a whole is one of a more feeble anatomical marking than the first or second molar.

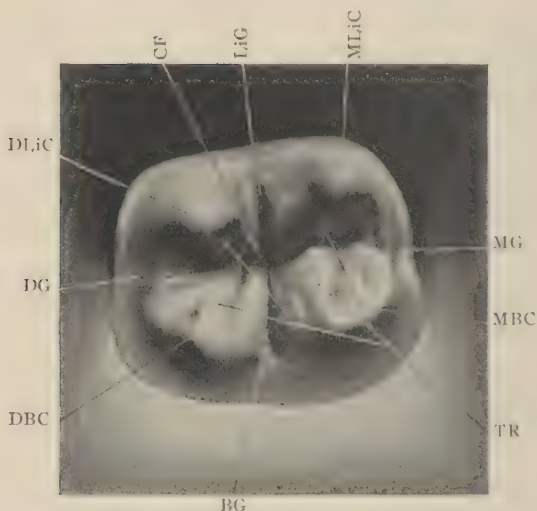


Fig. 97.—Occlusal surface of the lower right third molar. DLiC, Disto-lingual cusp; DG, Distal groove; DBC, Disto-buccal cusp; BG, Buccal groove; TR, Triangular ridges; MBC, Mesio-buccal cusp; MG, Mesial groove; MLiC, Mesio-lingual cusp; LiG, Lingual groove; CF, Central fossa.

The Root.

The root of the lower third molar may present a great many variations, but the typical tooth presents two prongs, with the mesial prong generally much larger than the distal. The mesial prong of the root may be almost straight or slightly curved distally, while the distal root may be much smaller and more round and curved distally to a greater extent. In some instances both the mesial and distal roots have their apexes curved distally.

The root of the lower third molar may be single with a single pulp cavity or one that is divided

into several parts. We may also find an irregular division of the root of the lower third molar, and any additional roots usually make their appearance on the buccal side of the tooth.

Pulp Cavity.

The pulp cavity of the lower third molar follows the general outline of the root, but there is a tendency for the apical portion to be constricted. There is also a tendency for a large number of apical foramina to develop on the mesial or distal

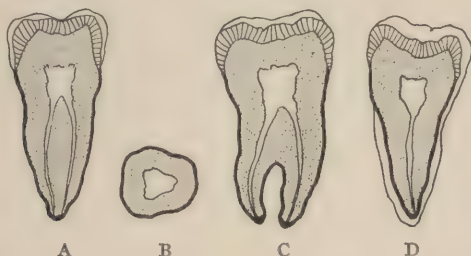


Fig. 98.—Pulp cavity of the lower third molar. A, Mesial root, bucco-lingual diameter; B, Cross section of root; C, Mesio-distal root, mesio-distal diameter; D, Distal root, bucco-lingual diameter.

root, which makes the treatment and filling of the tooth a very difficult matter. In the single-rooted lower third molars there may be one large pulp cavity or several which branch and ramify through the tooth in such a manner as to render proper cleaning almost impossible.

Occlusion.

The mesio-buccal inclined plane of the mesio-buccal cusp of the lower third molar occludes

with the disto-lingual inclined plane of the disto-buccal cusp of the upper second molar. The mesio-lingual inclined plane of the mesio-buccal cusp of the lower third molar occludes with the disto-buccal inclined plane of the disto-lingual cusp of the upper second molar. The disto-buccal inclined plane of the mesio-buccal cusp of the lower third molar occludes with the mesio-lingual inclined plane of the mesio-buccal cusp of the upper third molar. The disto-lingual inclined plane of the mesio-buccal cusp of the lower third molar occludes with the mesio-buccal inclined plane of the mesio-lingual cusp of the upper third molar. The mesio-buccal inclined plane of the mesio-lingual cusp of the lower third molar occludes with the disto-lingual inclined plane of the disto-lingual cusp of the upper second molar. The disto-buccal inclined plane of the mesio-lingual cusp of the lower third molar occludes with the mesio-lingual inclined plane of the mesio-lingual cusp of the upper third molar. The lingual inclined planes of the mesio-lingual cusp of the lower third molar have no occlusion.

The mesio-buccal inclined plane of the disto-buccal cusp of the lower third molar occludes with the disto-lingual inclined plane of the mesio-buccal cusp of the upper third molar. The mesio-lingual inclined plane of the disto-buccal cusp of the lower third molar occludes with the disto-buccal inclined plane of the mesial lingual cusp of the upper third molar. The disto-buccal inclined plane of the disto-buccal cusp of the lower

third molar occludes with the mesio-lingual inclined plane of the disto-buccal cusp of the upper third molar. The disto-lingual inclined plane of the disto-buccal cusp of the lower third molar occludes with the mesio-buccal inclined plane of the disto-lingual cusp of the upper third molar. The mesio-buccal inclined plane of the disto-lingual cusp of the lower third molar occludes with the disto-lingual inclined plane of the mesio-lingual cusp of the upper third molar. The disto-buccal inclined plane of the disto-lingual cusp of the lower third molar occludes with the mesio-lingual inclined plane of the disto-lingual cusp of the upper third molar. The lingual inclined plane of the disto-lingual cusp of the lower third molar has no occlusion.

Practical Consideration.

Being the last of the molars to erupt, the lower third molar makes its appearance between the lower second molar and the ramus of the mandible. It is more frequently impacted and is more liable to produce inflammation and may cause more trouble than any of the other molars. Since the crown is irregular in size it is very often larger than that of the second molar, which also attributes to the impaction of the tooth.

In the process of erupting, the crown may be directed anteriorly, and if conditions develop as they should it will eventually straighten itself. In other cases if impacted and in contact with the distal surface of the lower second molar it may

cause decay and produce inflammation because of pressure and the infection under the gum approximating the tooth. Owing to the slow manner in which the tooth erupts a flap of gum may cover the distal portion and food and debris may crowd into the central fossa and produce caries before the tooth is erupted.

If the third molar has taken its proper position it should receive the same care and treatment accorded any of the other molars, for it very often becomes a valuable tooth to use in the placing of bridges and artificial denture in old age. It should always be retained, if possible, to prevent a distal movement of the second molars and thereby destroy proximal contact between the first and second molars.

If the lower third molar is the source of infection it is much better to remove it as resulting evils will probably be less than those which are constantly present around an infected lower molar. If it becomes necessary to place bridges on the lower third molar or for any reason to devitalize it, the direction of the root canals and the number of roots should be carefully noted, because the roots are more often irregular than regular in shape.

CHAPTER VI.

DENTAL APPARATUS.

The upper and lower teeth taken together form respectively the upper and lower dental arch which have a certain anatomical arrangement and position as regards the individual teeth and the teeth to each other.

Occlusion is the relation of the inclined planes of the teeth or the relation which the inclined planes of the teeth of one arch bear to the teeth of the opposite arch, and in this combination the teeth taken together form a very effective masticating apparatus. It will be seen that each individual tooth in the dental arch occludes with two teeth of the opposite arch, with the exception of the upper third molar and lower central incisor.

The upper incisors overlap the lower incisors, the upper molars and premolars taking a position buccally to the lower molars and premolars. The lingual cusp of the upper molars and premolars all occlude between the buccal and lingual cusps of the lower molars and premolars (Figs. 99, 100, 101, and 102). The buccal cusps of the lower molars and premolars occlude between the buccal and lingual cusps of the upper molars and premo-



Fig. 99.—Normal occlusion of teeth. (Summa.)

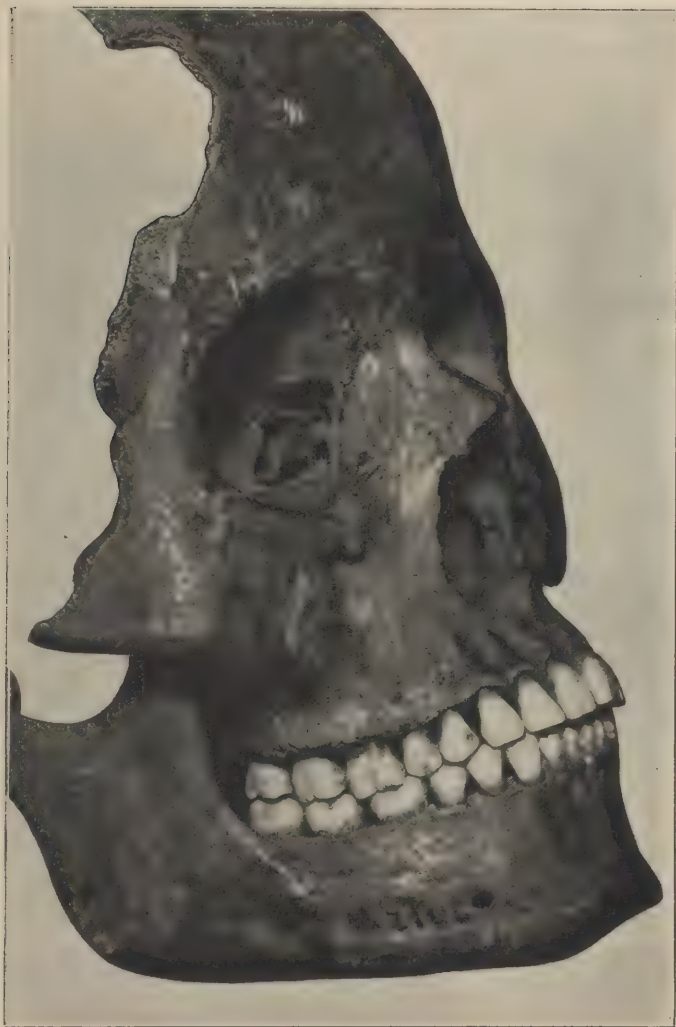


Fig. 100.—Normal occlusion (Aztec Skull). (Ketcham.)

lars. The mesial cusps of the upper molars occlude to the distal of the mesial cusps of the lower



Fig. 101.—Shows relation of lingual cusps of upper molar to lower.

molars. The mesial surfaces of the upper premolars occlude with the distal inclines of the lower premolars and canines.

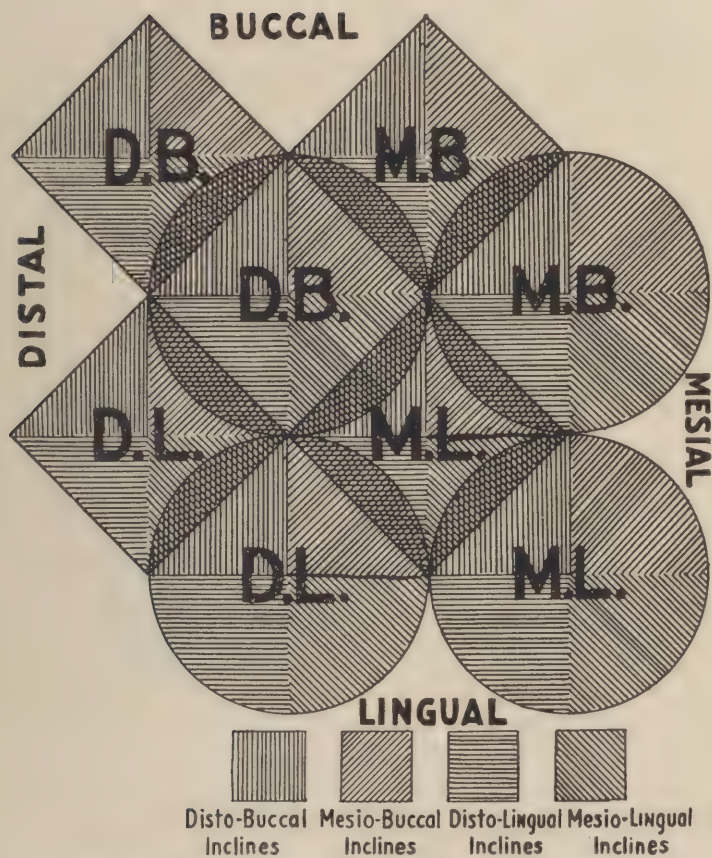


Fig. 102.—Shows relation of cusps and inclined planes. Upper cusps, square; lower cusps, round. Note position of mesio-lingual cusp of upper molar and disto-buccal cusp of lower.

Upper and Lower Dental Arch.

The shape and position of the upper dental arch varies according to racial characteristics and the shape of the individual teeth. In some cases the arch is long and narrow; in others short and broad. The arch curves in the form of an arc



Fig. 103.—Occlusal view of normal upper dental arch.

from the cuspid on the right side to the cuspid on the left side, and the canines which are the most prominent teeth form what is known as the canine eminences and give the fullness required by the mouth. From the canine to the third molars the line of direction may be straight, or it may be slightly convex, the convexity being towards the

cheek. When viewing the upper teeth from the anterior aspect it will be seen that they may be slightly curved (Fig. 104), the line being slightly curved gingivally with the canines or cuspids at the lowest point. As we pass the distal portion of the canines, it will be seen in the buccal view of the upper teeth that the upper first molar or the mesio-buccal cusp of the upper first molar occupies a



Fig. 104.—Buccal and labial views of upper dental arch.

more occlusal point than the second and third molars. This really gives two curves to the line or plane of occlusion of the upper arch. The upper molars and premolars are also placed in such a manner that the lingual cusps are situated more occlusally or lower than the buccal cusp, so that a straight line drawn from the lingual cusp on

the right side and extended to the lingual cusps on the left side would not touch the buccal cusp of either the right or left molars. The upper teeth approximate with each other by means of proximate contact points which correspond with the greatest convexity of the mesial and distal surfaces. These points are located near the occluso-buccal angle

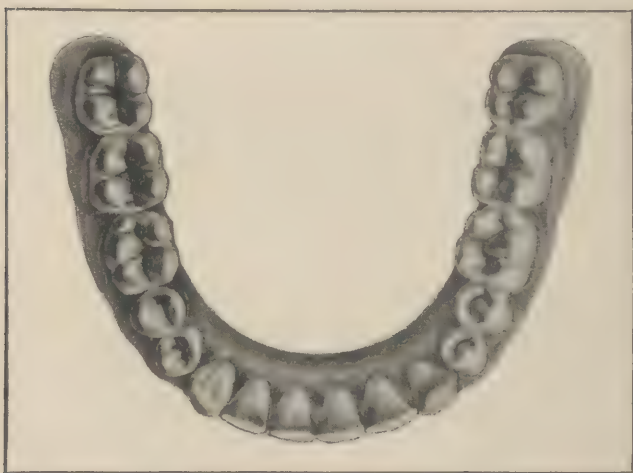


Fig. 105.—Occlusal view of lower dental arch.

of the proximate surfaces. The space between the teeth is known as the interproximate space and in the living individual is filled up with proximate gum tissue. In looking at the occlusal view of the teeth it will be found that a V-shaped space appears to the buccal and lingual of the proximate contact point. These V-shaped spaces are known as the buccal and lingual embrasures of the teeth.

The lingual embrasure is a triangular space the sides of which are much longer than those of the buccal embrasure which is also triangular-shaped with short sides and a wide base. The lower teeth (Figs. 105 and 106) are arranged similar to the upper teeth, but owing to the narrowness of the lower incisors the arch is smaller and consequent-



Fig. 106.—Buccal and labial views of lower dental arch.

ly the buccal cusps of the lower molars and premolars fall between the buccal and lingual cusps of the upper molars and premolars.

The cutting edges of the incisors and canines fall lingual to the cutting edges of the upper incisors and canines and occlude between the space or distance between the upper canines. In the normal dentures, the cutting edges of the lower

incisors strike occlusally to the linguo-gingival ridge of the upper incisors and canines. The teeth of the lower arch form curves which are practically opposite those of the upper arch. From the left canine to the right canine the cutting edges of the teeth are almost level; then as we pass from the canine distally to the third molar we find that the lower first molar occupies a point more gingival or lower than any of the other teeth. The buccal cusps of the lower molars and premolars are the highest of the cusps. The arrangement of the upper and lower teeth according to their anatomical forms is such that the food slides down the buccal surface and past the bucco-gingival marginal ridge without touching the soft tissue. On the lingual side the convexity of the lower molars and premolars is such that the food is also carried past the lingual margin.

On the upper incisors and canines the well developed linguo-gingival ridge protects the gingival tissue from the food during the process of incision. The extension of the buccal surface of the upper teeth beyond the lowers holds the cheek out of the way and prevents it being injured during the process of mastication. An examination of the upper and lower teeth will show that they are not perpendicular to the long axis of the dental arch. The upper molars and premolars are so arranged that the apexes are tipped towards each other which has the effect of throwing the occlusal surface slightly buccally. The lower molars and premolars are so shaped and set

in the dental arch that the occlusal surfaces are turned slightly to the lingual. The upper incisors and canines are set in the dental arch in such a manner that the cutting edge inclines slightly labially, which is also true of the cutting edge of the lower incisors and canines.

All of the teeth are slightly broader mesio-distally at the occlusal surface than at the neck, therefore when proximating with each other there is a V-shaped space between the upper and lower teeth (Figs. 104, 105, and 106).

The average measurement of the occlusal surface of a normal dental arch from the distal surface of the right third molar to the distal surface of the left third molar, according to Black, is about one hundred and twenty-seven millimeters, or five inches. The average measurement taken at the neck of the tooth is about eighty-nine millimeters, or three and one-half inches. On account of the various shapes of the crowns of the teeth and also as a result of wear, the interproximate space varies in size and shape.

In teeth which have long narrow crowns the interproximate spaces are much longer occluso-gingivally than in short flat teeth. As the teeth become worn down as a result of mastication, there is also a wear on the proximate side with the result that the teeth grow closer together and the interproximate space becomes much narrower. The proximate surface of a newly erupted tooth is round and convex in all directions. The proximate surface of a tooth of an older in-

dividual is flat and in some instances one tooth may be worn concave while the other remains flat or slightly convex. On the buccal and lingual side of the proximate contact points are the interproximate embrasures which also differ in size according to the shape of the teeth. Owing to the fact that the proximate contacts are near the buccal surfaces, the linguo-occlusal embrasures present a longer slope than the bucco-occlusal embrasures, and consequently there is a tendency during mastication for the food to slide towards the oral cavity rather than towards the buccal cavity.

In well developed molars and premolars the proximate contact is near the occlusal border, but in poorly formed teeth it may be near the gingival, in which case the food wedges between the teeth, and consequently they are not self-cleansing. If the proximate contact is near the occlusobuccal angle, the food which crowds between the proximate contact will necessarily be deflected towards the buccal or lingual embrasures by the interproximate gum tissue which fills that space. As the proximate contact becomes more worn there is less tendency for the teeth to remain self-cleansing and a greater opportunity is offered for caries to develop in such conditions than where the proximate contact is still round. In dentures in which we find a three-cusped lower second premolar, the proximate contact between the lower molar and the lower second premolar is quite broad due to development of the two lingual cusps.

In upper dental arches in which the disto-lin-gual cusp of the upper first molar is well developed, a broad proximate contact may be found between the upper first and upper second molars. In lower first molars which have a disto-buccal cusp the development of the disto-buccal cusp of the lower first molar brings the proximate contact of that tooth with the second lower molar near the buccal angle. This would also be true in those cases where the lower second molar has a disto-buccal cusp in relation to the third molar.

Many false proximate contacts occur as the result of the imperfect development of the enamel. In such cases the gums become diseased very early in life due to food wedging between them and caries soon develop. As the proximate contact is very important in the cleansing of the teeth it becomes necessary in the restoration of fillings that the proximate contact be preserved in the proper form. If the restoration has not the proper form and food wedges in between the teeth, the interproximate gum tissue will be forced away; eventually a pocket will be formed by the constant pressure of the food; there will be atrophy of the gum tissue and finally an exposure of the alveolar process as a result of mechanical irritation produced by the food wedging between the teeth.

The study of the alveolar process, the gum tissue, and the peridental membrane belongs under the head of dental histology and therefore these subjects will not be discussed in this work.

CHAPTER VII.

DECIDUOUS TEETH.

Elsewhere in this work it has been mentioned that man has two sets of teeth, the permanent and deciduous. The deciduous teeth are those which erupt in early childhood. The first tooth usually makes its appearance when the child is about six months of age and is either the upper or lower central incisor. Deciduous teeth serve the purpose of mastication during the early life of the child, and also serve as factors in the growth of the jaw through stimulation produced by use. As the permanent teeth erupt in the normal developing child the root of the deciduous teeth are absorbed and their crowns fall away. This shedding process of the deciduous teeth begins about the seventh year and is generally complete about the twelfth or fourteenth, depending upon the development of the individual.

The permanent teeth which take the place of the deciduous are also known as succedaneous teeth. There are twenty deciduous teeth, ten in each arch, which are, respectively, two central incisors, two lateral incisors, two cuspids, or canines, and four molars. There are no premolars, or bicuspid, in the deciduous set and therefore the first deciduous molar proximates with the distal portion of the canine. The deciduous cen-

trals, laterals, and canines, or cuspids, have the same general outline regarding the form and lobe construction that we find in the permanent teeth.

The deciduous teeth have the same form as the permanent teeth which replace them, although

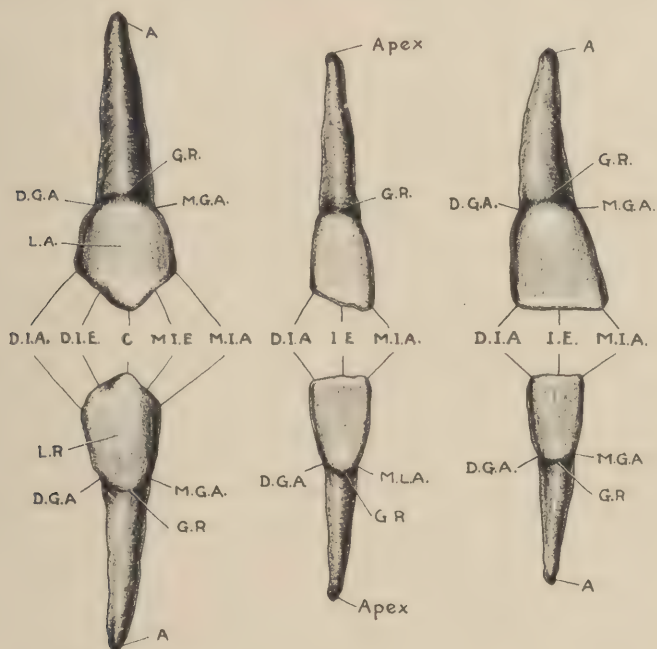


Fig. 107.—Labial view of upper and lower deciduous incisors and canines. C, Cusp; DIE, Disto-incisal edge; DGA, Disto-gingival angle; A, Apex; GR, Gingival ridge; MGA, Mesio-gingival angle; DIA, Disto-incisal angle; MIA, Mesio-incisal angle; MIE, Mesio-incisal edge.

they are smaller in all dimensions. The deciduous molars are replaced by the premolars, or bicuspids, and the premolars differ considerably from the deciduous molars. The deciduous second

molars of both the upper and lower set very closely resemble the upper and lower first permanent molars. The deciduous first molars, both upper and lower, do not resemble any of the permanent teeth, either of the molar or premolar series.

The crowns of the temporary teeth which resemble the permanent teeth and have the same anatomical points as regards construction have already been discussed, but their anatomical variations in the arrangement of ridges and grooves will have to be considered.

As a rule the gingival marginal ridges of the deciduous teeth are larger than those of the permanent teeth, and consequently there is a greater constriction at the neck. The roots are proportionately larger as regards the crown. Being long and slender the roots of the molars flare more at the apex than the roots of the permanent molars. It is claimed by some authorities that the enamel of the deciduous teeth is whiter than it is in the permanent teeth, although this does not hold true in all cases.

In the deciduous molars there is a large constriction at the neck of the tooth just below the gingival marginal ridge, with the result that the gingival marginal ridge is well developed and the buccal and lingual surfaces of the deciduous molars are inclined occlusally as they pass towards the occlusal surface. The result is that the buccolingual diameter of the occlusal surface of the deciduous molars is much less than the gingival di-

ameter. This decreased diameter bucco-lingually causes the crown of the deciduous molar to appear longer mesio-distally. The deciduous centrals, laterals, and canines, as mentioned above, have the same general outline and lobular con-

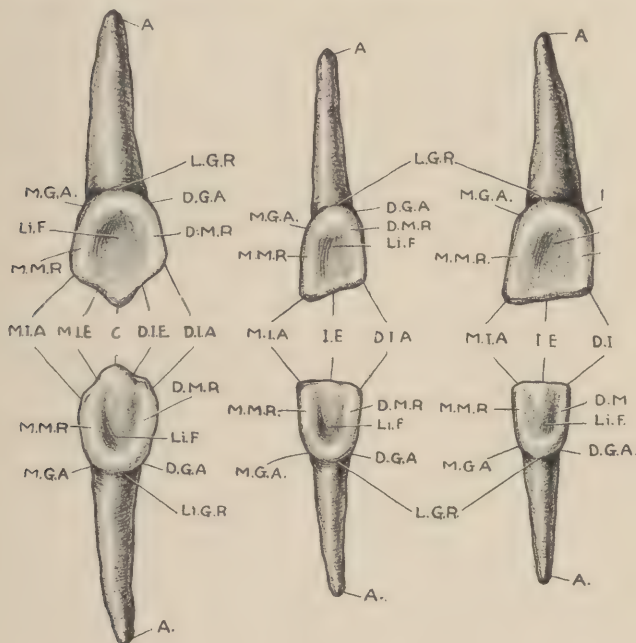


Fig. 108.—Lingual surface of deciduous incisors and canines. C, Cusp; MIE, Mesio-incisal edge; LiF, Lingual fossa; MIA, Mesio-incisal angle; MMR, Mesial marginal ridge; MGA, Mesio-gingival angle; A, Apex; DMR, Distal marginal ridge; LGR, Linguo-gingival ridge; DIA, Disto-incisal angle; IE, Incisal edge; DGA, Disto-gingival angle.

struction as the permanent teeth, with the exception that the gingival marginal ridges on all of these teeth are well developed and the roots comparatively small. In newly erupted deciduous

teeth the cutting edges present mamelons which are soon worn off. Both the upper and lower deciduous canines when they first erupt present well developed cusps which are also very soon worn off as the result of mastication.

UPPER FIRST DECIDUOUS MOLARS.

The upper first deciduous molars present for study four surfaces—the buccal, lingual, mesial, and distal, a root which is divided into three prongs, and the occlusal surface which is divided into three lobes. The buccal surface of the upper first deciduous molar is convex mesio-distally and occluso-lingually; the greatest amount of convexity, occluso-lingually, is at the gingival ridge which is well developed and slopes abruptly to the neck of the tooth and slopes gradually towards the occlusal surface and the center of the tooth. The buccal surface is divided by the buccal groove generally situated to the distal of the center of the tooth with the result that the mesio-buccal cusp is larger than the disto-buccal cusp. The gingivo-occlusal diameter of the buccal surface in the region of the mesio-buccal cusp is about one-fourth greater than it is in the region of the disto-buccal cusp. The mesio-buccal cusp is marked by a well developed buccal ridge which extends from the tip of the cusp gingivally. There is also a slightly developed ridge on the disto-buccal cusp. The lingual surface of the upper first deciduous molar is decidedly convex mesio-distal-

ly and occluso-lingually. The entire lingual surface is made up of a well developed lingual cusp which is decidedly convex. The cusp of the lingual surface is rounded and is not as sharp as the

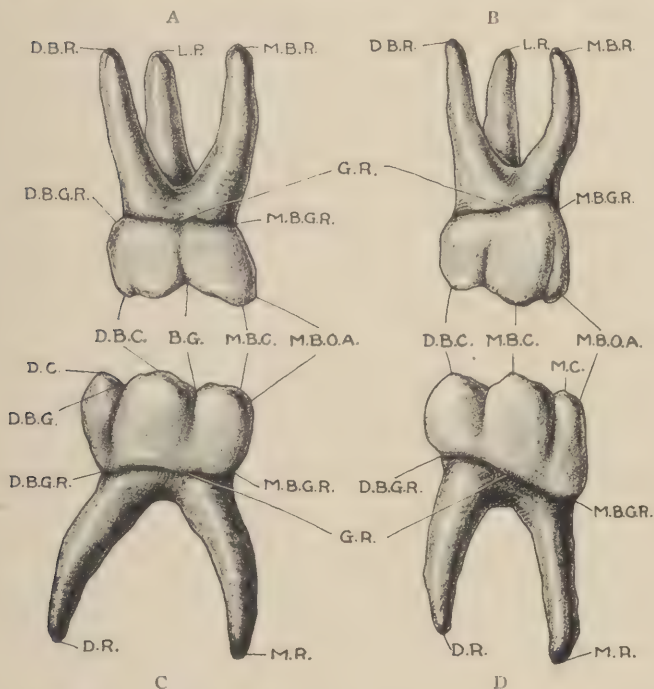


Fig. 109.—Buccal view of deciduous molars. A, Upper second molar; B, Upper first molar; C, Lower second molar; D, Lower first molar. D.B.R., Disto-buccal root; D.B.G.R., Disto-bucco-gingival ridge; B.G., Buccal groove; D.B.C., Disto-buccal cusp; M.B.C., Mesio-buccal cusp; M.C., Mesial cusp; M.B.O.A., Mesio-bucco-occlusal angle; M.B.G.R., Mesio-buccal gingival ridge; G.R., Gingival ridge; M.B.R., Mesio-buccal root; L.R., Lingual root; D.C., Distal cusp.

mesio-buccal or disto-buccal cusp. The lingual surface joins the distal surface at almost a right angle while it joins the mesial surface at a decided

obtuse angle. The difference in diameter between the two large buccal cusps and the lingual cusp is at the expense of the mesial surface. The mesio- and disto-occlusal marginal ridges of the lingual surface slope gradually from the highest point of the cusps and join the mesial and distal marginal ridges of the mesial and distal surfaces.

There are no grooves which cross the lingual surface of the upper first deciduous molar. The mesial portion of the upper first deciduous molar presents the same line angles and point angles as the mesial surface of a permanent molar. The mesial surface slopes distally from the buccal angle of the mesial surface towards the lingual cusps. Therefore the union of the mesial surface with the buccal surface is an acute angle while the union of the mesial surface with the lingual surface forms an obtuse angle. The lingual surface is crossed by the mesial groove which arises from the central fossa and passes over the crown of the tooth. The lingual surface may be slightly convex although as a rule it is very nearly flat with a well developed gingival ridge. The distal surface of the upper first deciduous molar has the same line angles and point angles as the distal surface of the permanent molars and is slightly convex, joining both the buccal and lingual surfaces at nearly a square or right angle. The marginal ridge is fairly well developed and is crossed by a distal ridge arising from the central fossa. The occlusal surface of the upper first deciduous molar in the majority of cases presents an irregu-

lar triangular form with the buccal margin much longer than the lingual margin; the mesial margin joins the buccal margin at an acute angle and

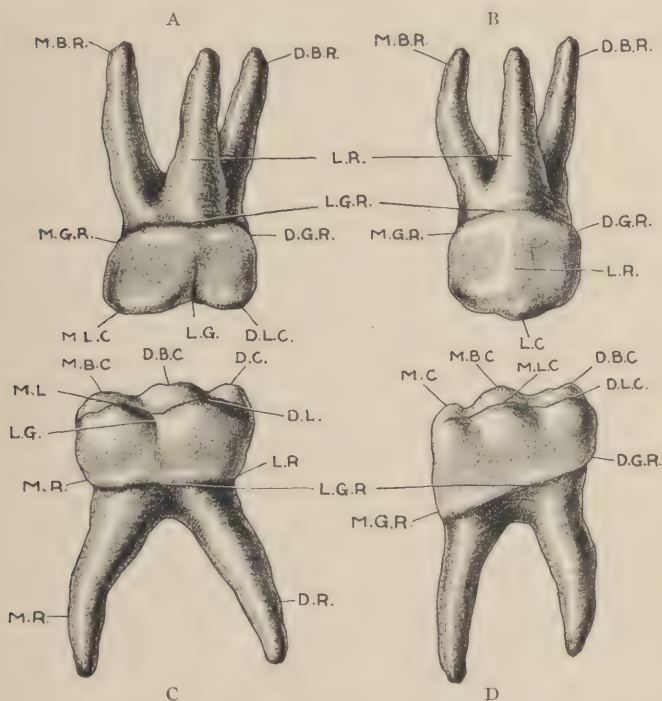


Fig. 110.—Lingual view of deciduous molars. A, Upper second molar; B, Upper first molar; C, Lower second molar; D, Lower first molar; MBR, Mesio-buccal root; MGR, Mesio-lingual ridge; MBC, Mesio-buccal cusp; MLC, Mesio-lingual cusp; LG, Lingual groove; MR, Mesial ridge; MR, Mesial root; DR, Distal root; MBC, Mesio-buccal cusp; LR, Lingual ridge; DBC, Distal-buccal cusp; LC, Lingual cusp; DGR, Distal-lingual ridge; LGR, Lingual-lingual ridge; LR, Lingual root; DBR, Distal-buccal root; DC, Distal cusp; MC, Mesial cusp.

the lingual margin at an obtuse angle, and the distal margin joins the lingual and buccal surfaces at almost a right angle. The typical form of the

upper first deciduous molar may be said to present three lobes or cusps which are known as the mesio-buccal, disto-buccal and lingual cusps. There are three grooves: the mesial groove, which originates in the central fossa and runs mesially; the distal groove, which originates in the distal fossa and runs distally over the disto-occlusal margin; and the buccal groove, which runs buccally from the central fossa and separates the mesio-buccal from the disto-buccal cusp. The central fossa as a rule is quite well developed.

The buccal margin of the occlusal surface is made up of the mesio-buccal and disto-buccal cusps; the mesio-buccal is much the largest and takes up the greatest amount of the bucco-occlusal surface. In some cases the disto-buccal cusp is very poorly developed or may be absent entirely as in Fig. 112. The lingual portion of the occlusal surface is represented by the lingual cusp which appears in all forms of the upper first deciduous molars as a crescent-shaped cusp which joins the mesial and distal marginal ridges with a well rounded angle. Figs. 111 and 112 show two forms of deciduous upper first molars which are found in a large number of cases.

LOWER FIRST DECIDUOUS MOLARS.

The lower first deciduous molar has an outline that differs from any of the other deciduous molars or any of the permanent teeth. The principal point of difference is that it possesses in the typi-



Fig. 111.—Upper right first and second deciduous molars and first permanent molar. MBOA, Mesio-bucco-occlusal angle; CF, Central fossa; DMR, Distal marginal ridge; DBOA, Disto-bucco-occlusal angle; MBC, Mesio-buccal cusp; BG, Buccal groove; DBC, Disto-buccal cusp; DBC, Disto-buccal cusp; DG, Distal groove; DLiC, Disto-lingual cusp; DLiG, Disto-lingual groove; MLiC, Mesio-lingual cusp; TR, Triangular ridge; LiG, Lingual groove; LiOA, Linguo-occlusal angle; MLiOA, Mesio-linguo-occlusal angle; DLiOA, Disto-linguo-occlusal angle; LiC, Lingual cusp; MLiG, Mesio-lingual groove; MMR, Mesial marginal ridge.

cal forms a mesial cusp and a mesial fossa which are not found in any of the other molars. The buccal surface of the lower first deciduous molar presents the same line angles and point angles as the buccal surface of the permanent molars. There is a well developed gingival ridge which runs from the mesial to the distal margin and stands out prominently at the neck of the tooth. The gingival marginal ridge joins the mesial portion of the buccal surface at an acute angle while it joins the distal portion of the buccal surface at an obtuse angle. The distal line angle of the buccal surface is decidedly convex, while the mesial line angle is very nearly straight. The buccal surface of the lower first deciduous molar is crossed by two grooves, mesio-buccal and buccal. The mesial groove arises in the mesial fossa near the mesio-buccal angle of the cusp and separates the mesial cusp from the mesio-buccal cusp. The buccal groove arises in the central fossa and passes buccally between the disto-buccal and mesio-buccal cusps, generally to the distal of the center of the tooth, and divides the mesio-buccal from the disto-buccal lobe. The buccal surface is convex, mesio-distally and occluso-lingually, and slopes very abruptly towards the occlusal surface, so that the gingival margin of the tooth is much wider than the occlusal border, bucco-lingually. The lingual portion of the lower first deciduous molar is convex, mesio-distally and occluso-lingually, and the surface slopes from the well developed gingival margin towards the center of the

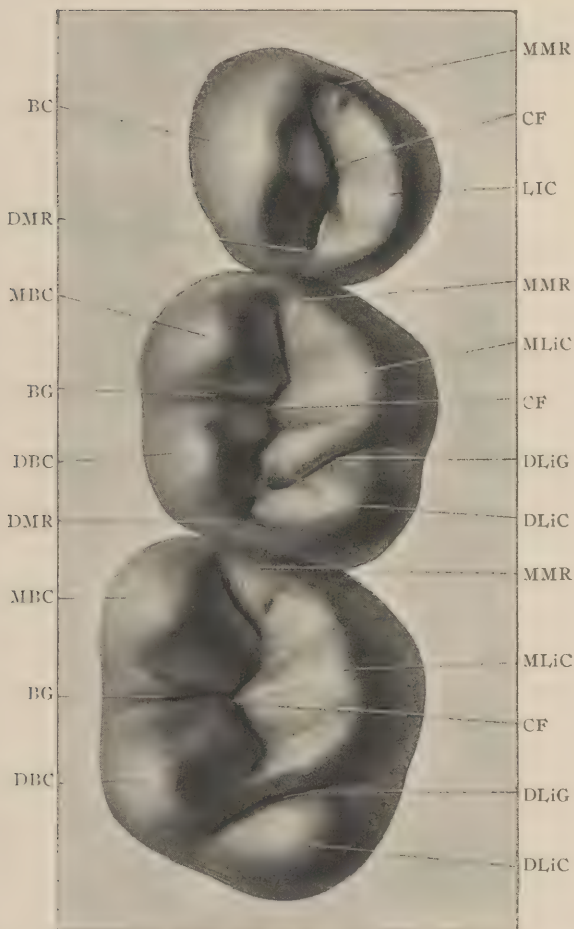


Fig. 112.—Occlusal view of the upper first and second deciduous molars and the upper first permanent molar. BC, Buccal cusp; DMR, Distal marginal ridge; MBC, Mesio-buccal cusp; BG, Buccal groove; DBC, Disto-buccal cusp; DLiC, Disto-lingual cusp; DLiG, Disto-lingual groove; CF, Central fossa; MLiC, Mesio-lingual cusp; MMR, Mesial marginal ridge; LiC, Lingual cusp.

tooth as it passes occlusally. Near the mesial portion of the lingual surface we find the mesio-lingual groove which arises from the mesial fossa and separates the mesial cusps from the mesio-lingual cusp. The mesio-lingual and disto-lingual cusps are separated from each other by a well-developed lingual groove which passes over the occluso-lingual margin of the tooth and continues for a short distance along the lingual surface. The mesial surface is decidedly convex, made especially so by the development of the mesial cusps, and in some instances is placed nearer the buccal and in others nearer the lingual portion of the mesial surface. There are really two mesial grooves originating from the mesial fossa, called the mesio-buccal groove and the mesio-lingual groove, which separate the mesial cusp from the rest of the cusps of the tooth. The mesial marginal ridge is irregular or elevated in the region of the mesial cusp which is a development found on none of the other molars. The distal surface of the lower first deciduous molar is decidedly convex and the marginal ridge is crossed by the distal groove which arises in the central fossa. The occlusal surface of the lower first molar is a modified parallelogram with the angles more or less rounded. It presents for study two fossæ—the principal fossa, which takes up about three-fourths of the distal portion of the tooth, and the mesial fossa, which is located mesially to the mesio-buccal and mesio-lingual cusps. The four principal lobes of the tooth, mesio-buccal,

mesio-lingual, disto-buccal, and disto-lingual, are separated from each other by grooves which originate from the central fossa. The mesial groove arises in the central fossa and passes over the mesial transverse ridge which is formed by the triangular ridges of the mesial cusps and ends in the mesial fossa. From the mesial fossa a groove known as the mesio-buccal groove passes mesio-buccally over the mesial margin of the tooth. Another groove passes mesio-lingually toward the mesio-lingual angle of the tooth and is known as the mesio-lingual groove. The buccal groove arises in the central fossa generally at an angle which is located at that point and passes buccally over the occlusal margin of the tooth separating the mesio-buccal from the disto-buccal lobe. This groove divides the buccal margin of the tooth into the mesio-buccal and disto-buccal cusps. The lingual groove originates in the central fossa and may pass lingually as one well developed groove which may be a sulcate groove or it may be divided into several branches. The distal groove is one which arises in the distal portion of the central fossa and passes slightly disto-lingually over the distal marginal ridge and may also be divided. The distal groove may be deflected disto-buccally by the triangular ridge of the disto-lingual cusp in the first part of its course, but then it generally turns to the lingual as it passes over the distal margin. The mesio-buccal cusp presents a well developed buccal ridge which runs from the tip of the cusp bucco-gingivally, and a

short triangular ridge which runs lingually towards the central fossa. The mesial cusp is formed by the mesial fossa and by the development of the mesio-buccal and mesio-lingual groove. The mesio-lingual cusp presents a well-developed triangular ridge, which runs from the tip of the cusp buccally towards the central fossa and joins the triangular ridge of the mesio-buccal cusp to form the transverse ridge of the occlusal surface. Another ridge runs lingually (linguo-

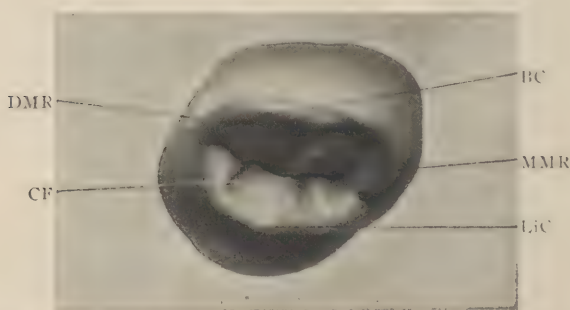


Fig. 113.—Occlusal view of one type of upper first deciduous molar. DMR, Distal marginal ridge; CF, Central fossa; LiC, Lingual cusp; MMR, Mesial marginal ridge; BC, Buccal cusp.

gingivally) from the tip of the mesio-lingual cusp and divides the lingual surface of the cusp into two inclined planes. The triangular ridges of the mesial and distal cusps form the transverse ridges of the occlusal surface of the lower first deciduous molar. The disto-buccal lobe of the lower first deciduous molar presents a well developed cusp which slopes mesially along the mesio-buccal margin of the buccal groove and

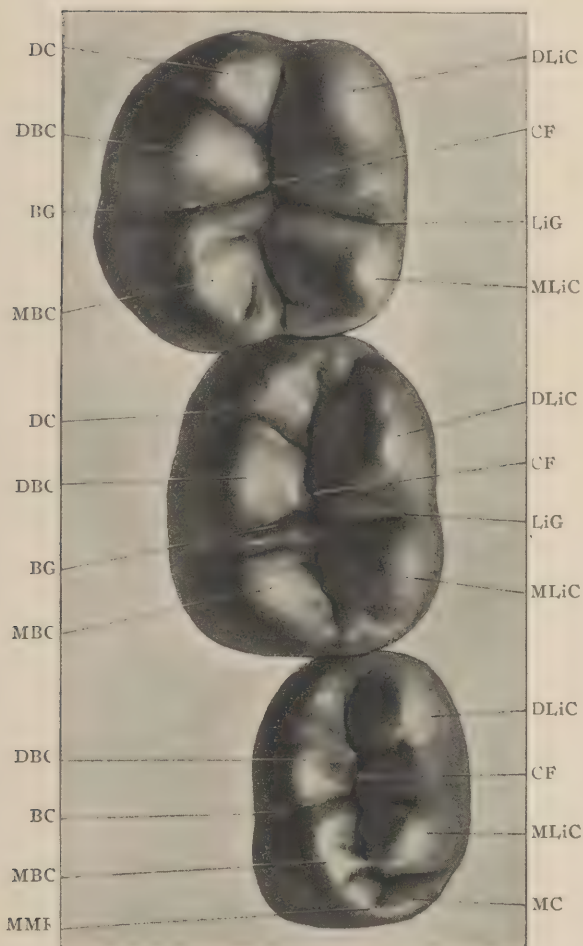


Fig. 114.—Occlusal view of the lower first and second deciduous molars and the lower first permanent molar. DC, Distal cusp; DBC, Disto-buccal cusp; BG, Buccal groove; MBC, Mesio-buccal cusp; MMR, Mesial marginal ridge; MC, Mesial cusp; CF, Central fossa; DLiC, Disto-lingual cusp; MLiC, Mesio-lingual cusp; LiG, Lingual cusp.

distally towards the disto-buccal angle of the tooth. It has a well developed buccal ridge which runs from the tip of the cusp bucco-lingually, and a well developed triangular ridge which runs towards the central fossa. The disto-lingual cusp of the lower first deciduous molar is usually the smallest of the four principal cusps and presents a triangular ridge which runs buccally towards the central fossa, and mesio-buccal and disto-buccal marginal ridge, and the lingual ridge which runs from the tip of the cusp linguo-lingually. The principal or central fossa of the lower first deciduous molar is generally deep and well rounded and the triangular ridges of the cusps pass well into the central fossa. The mesial fossa is usually sharp and deep and is located mesial to the transverse ridge of the occlusal surface and distal to the mesial cusp.

Root of the First Deciduous Molars.

The root of the upper first deciduous molar is divided into three prongs, the mesio-buccal, disto-buccal, and lingual. These prongs generally converge a great deal from each other with the result that they are very flaring and the tips of the prongs are generally wider than the occlusal surface of the crown. The root of the lower first deciduous molar is divided into two prongs, a mesial and distal. The roots of both the first deciduous molars spread in such a manner as to envelope the erupting premolars. The roots of the deciduous teeth are much thinner than the

roots of the permanent teeth and for that reason appear comparatively much longer.

SECOND DECIDUOUS MOLARS.

The upper and lower second molars (Figs. 109 and 110, A and C) present the same anatomical markings as the permanent molars of the same series. Figs. 111, 112 and 114 show the relative size and proportion of the first and second deciduous molars with the permanent molars of the upper and lower arch. It will be observed that the lower and upper second deciduous molars present practically the same outline as regards the cusps, lobes and grooves as does the first permanent molar. The distal lobe of the lower second deciduous molar is larger than the distal lobe of the lower first permanent molar, and therefore the distal border of the lower second deciduous molar projects distally until it is perpendicular with the border of the upper second deciduous molar. In other words, as compared to the bucco-lingual diameter, the mesio-distal diameter of the lower second deciduous molar is greater than the diameter of the lower first permanent molar. The distal marginal ridge of the lower second deciduous molar is wider mesio-distally and the distal groove is longer. The distal cusp is larger as compared with the mesio-buccal and disto-buccal cusps than is the distal cusp of the lower first permanent molar. The upper second deciduous molar presents practically the same

outline as the upper first permanent molar, and the cusps are about the same relative size. The roots of the second deciduous molars are larger in proportion than the roots of the permanent teeth, and the apexes flare away from each other to a greater extent because the roots accommodate the germs of the second bicuspid during the process of development.

CHAPTER VIII.

PULP CAVITY, OR PULP CHAMBER.

A thorough understanding of the pulp cavity, or pulp chamber, of the teeth is very necessary to the practitioner of dentistry. In the description of each one of the permanent teeth the author has given a description of a "typical" pulp cavity and has also mentioned certain anomalies which may be found in some of these cases. The pulp cavity of the deciduous teeth follows the same general outline as the pulp cavity of the permanent teeth and one should be more or less familiar with the pulp cavity in the filling of deciduous teeth when it becomes necessary to devitalize. The root of the deciduous tooth under normal conditions is absorbed as the permanent tooth erupts and therefore the pulp cavity of the deciduous teeth must be treated in such a manner that it will not interfere with the absorption of the deciduous root, or complications will arise during the eruption of the permanent tooth.

As the pulp cavity of the deciduous tooth concerns us only during the life of the deciduous tooth, or probably from the period extending from seven to twelve years, there are not as many serious conditions from a systemic standpoint as usually arise from the pulp cavity of the permanent teeth. Modern practice shows that a large per-



Fig. 115.—Cross sections of teeth to show pulp cavities. (From the collection of Dr. Richard H. Kiehlmüller.)

centage of systemic conditions have been the result of improper treatment of the pulp canal, with the result that the infection occurs at the end of

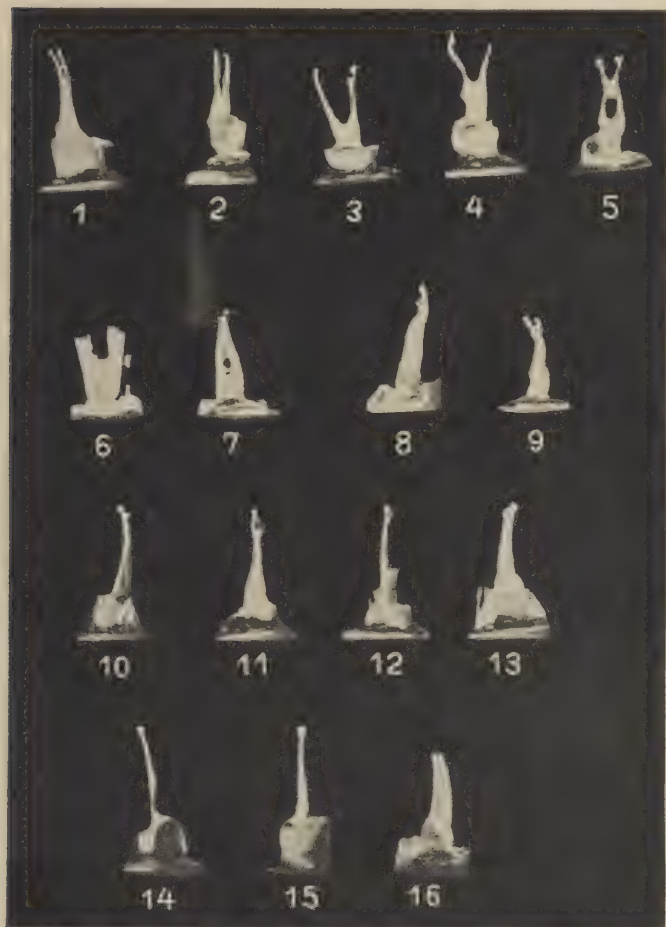


Fig. 116.—Pulp canal filling after the decalcification of the tooth. (Prepared by Dr. Richard H. Riethmüller.)

the root. Improper treatment of the root canal and the development at the end of the root of the secondary infection, or granuloma, according to modern pathology, is responsible for a large num-



Fig. 117.—Premolar pulp canal filling after the decalcification of the tooth. (Prepared by Dr. Richard H. Riethmüller.)

ber of ills which heretofore had not been understood.

Having been proved that systemic disease in the individual can easily arise from improperly treated pulp canals, it therefore is imperative that

the dental student become familiar with the possibilities of anomalies which may arise in the pulp cavity, and he should constantly be on the alert for such conditions. In the living individual, the



Fig. 118.—Premolar pulp canal filling after the decalcification of the tooth. (Prepared by Dr. Richard H. Riethmüller.)

pulp cavity can be best studied by careful exploration with the assistance of radiographs which show the direction and shape of the root of the tooth. However, there are a number of small fine



Fig. 119.—Molar pulp canal filling after the decalcification of the tooth. (Prepared by Dr. Richard H. Riethmüller.)

ramifications of the pulp cavity in a large number of teeth which cannot be revealed by the x-ray and which are always susceptible to more or less

disturbance, which makes it necessary for the dentist to be constantly on the alert for such conditions, and to use the greatest possible amount of skill and care in treating such conditions. Fig. 115 shows the cross section of a number of teeth



Fig. 120.—Molar pulp canal filling. (Prepared by Dr. Richard H. Riethmüller.)

that present anomalies as regards the pulp cavity and the root. The second and third picture in the top row from the right show two canines with bifurcated roots, which would be very difficult to fill. The remaining pictures in the top row are cross sections made from premolars, which show

the different arrangement of the pulp cavity, the well developed coronal portion of the main body

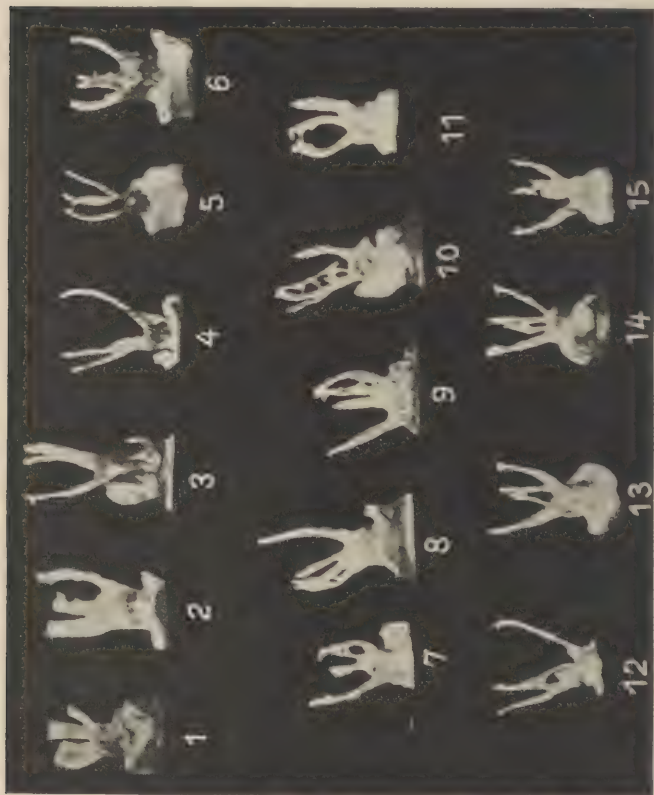


Fig. 121.—Molar pulp canal filling. (Prepared by Dr. Richard H. Riethmüller.)

of the pulp cavity, and the tendency for the formation of bifurecations in the root.

In a study of pulp cavities as revealed in various molars, conditions are shown which are very difficult to handle and which can only be treated

by the greatest possible amount of care in order to thoroughly fill the roots in these teeth. While



Fig. 122.—Molar pulp canal filling. (Prepared by Dr. Richard H. Riethmüller.)

these anomalies do not exist in all conditions, and it will be seen that a large number of these roots are curved, nevertheless, they exist often enough

that the dentist should be constantly on the alert for such conditions.

Fig. 116 shows a number of preparations obtained by filling the pulp cavities of extracted



Fig. 123.—Pulp canal filling photographed through tooth. (Prepared by Dr. Forrest D. Orton.)

teeth under pressure and then decalcifying the tooth substance and leaving the filling material intact. The tooth is generally filled with paraffin or some substance that is not affected by the decalcifying process. In Fig. 116 (No. 1) is

shown a root canal which bifurcates at the apex, the two apices of which are connected by an isthmus that would be almost impossible to thoroughly fill. This does not necessarily mean that



Fig. 124.—Pulp canal filling photographed through tooth. (Prepared by Dr. Forrest D. Orton.)

the tooth should be sacrificed, for by proper care and antiseptic treatment it could be filled in such a manner as to prevent considerable infection occurring from the isthmus which connects the two apical portions of the pulp canal. No. 5 also

shows a condition which is very difficult to treat properly, owing to the fact that the pulp canal after leaving the body of the tooth spreads out again into a large body and then terminates in two fine apices. The lower isthmus of the pulp



Fig. 125.—Pulp canal filling photographed through tooth. (Prepared by Dr. Forrest D. Orton.)

tissue would be very difficult to remove in the treatment of the tooth. The other pulp canals shown in Fig. 116 present many variations, but none of them would be as difficult to effectively handle as Nos. 1 and 5 mentioned above. Fig. 117



Fig. 126.—Pulp canal photographed through tooth. (Prepared by Dr. Forrest D. Orton.)

also shows a large number of root canals of premolars and molars presenting pulp cavities that vary from typical anatomical forms as described

in anatomical works, but which exist in a comparatively large number of teeth.

Fig. 118 shows other forms of pulp cavities in



Fig. 127.—Apical end of root showing branching pulp canals. (Prepared by Dr. Richard H. Riethmüller.)

molars and premolars which have exceedingly long roots, and in which it would be necessary to employ the radiograph to learn the depth to

which the pulp cavity extends. The pulp cavities in Fig. 119 show a large number of anomalies or variations from the normal. No. 4 in Fig. 119 rep-



Fig. 128.—Radiograph of lower second and third molar. (By Dr. E. D. Skinner from Dr. Geo. F. Moffatt's specimen.)

resents a condition which would be very difficult to treat because of the large number of ramifications crossing the branches of the pulp cavity of the root of the tooth. No. 10 also shows another

condition which would be very difficult to handle, as it would be almost impossible to properly cleanse and remove all the pulp tissues found in these roots. Figs. 120 and 121 represent a large number of pulp cavities of upper permanent molars in which the lingual root has a great many



Fig. 129.—Radiograph of upper and lower lateral half of dental apparatus. (By Dr. E. H. Skinner from Dr. Geo. F. Moffatt's specimen.)

branches instead of only a single pulp canal. Fig. 122 shows the peculiar outline of the pulp cavities in premolars and upper and lower molars. Figs. 123, 124, 125, and 126 are photographs of teeth

that have been filled with a dark material. The roots were rendered transparent and photographed in that manner. In Fig. 126 are seen a large number of ramifications at the end of the root, which shows there are many apical foramina and not only one as we have been led to believe. Figs 124 and 125 show ramifications of the pulp



Fig. 130.—Radiograph of right side of mouth. (By Dr. E. H. Skinner from Dr. Geo. F. Moffatt's specimen.)

cavity in the central portion of the root, so located as to make absolutely perfect cleansing of the pulp cavity almost an impossibility. Fig. 127 illustrates the manner in which the apical foramen

may ramify at the apex, branching out at right angles to the long axis of the tooth and leaving certain portions practically inaccessible to any modern means of instrumentation.



Fig. 131.—Front view of teeth. (By Dr. E. H. Skinner from Dr. Geo. F. Moffatt's specimen.)

These various pulp cavities have been shown in order to impress upon the student the fact that all pulp cavities are not typical and that one must constantly be on the alert for abnormalities. As

stated before, in the living individual the radiograph is the only means of revealing the true condition of the pulp cavity, but small branches and ramifications can not be revealed by the radiograph except as to their general outlines. The radiograph is also very valuable in studying



Fig. 132.—Radiograph of molars and premolars. (By Dr. E. H. Skinner from Dr. Geo. F. Moffatt's specimen.)

curvatures of the root. The radiographs shown in Figs. 129 to 133 were made from a skull which possessed a normal set of teeth in normal occlusion—probably the most perfect arrangement

of teeth that the author has ever seen. It will be observed even in this set of teeth that all of the roots are not typical or of the same shape, and that the pulp cavities are not all of the same design.



Fig. 133.—Radiograph of skull. (By Dr. E. H. Skinner from Dr. Geo. F. Moffatt's specimen.)

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